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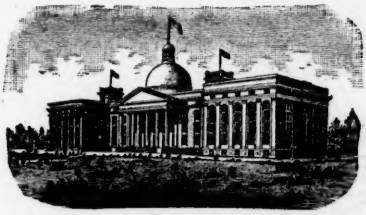

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# THE KANSAS CITY REVIEW,

DEVOTED TO

*Science, The Arts, Industry and Literature.*

VOL. IX. DECEMBER, 1885. NO. 5.

## THE THEORY AND DEVELOPMENT OF ELECTRO-MAGNETISM.

This article is not intended as a technical essay on the subject treated, but rather as an attempt to give some simple explanations of what is generally considered a mysterious force, and a concise history of its development.

Galeazza, in honor of whom the first electric car operated in the West is named, was the family name of the wife of Galvani. To her the credit is given for first bringing to notice the fundamental principles of Electro-Magnetism.

In 1831, Prof. Faraday discovered that by moving a wire to or from a magnet, a current of electricity appeared, or was induced, in the wire.

What Electricity is, we do not know. A wire through which a current is traveling is nowise altered in appearance, yet its presence can be easily demonstrated.

According to the modern theories, Electricity, like heat and light, is a form of motion, and is convertible into other natural forces at will. Thus, heat produces electricity; electricity magnetism; magnetism force, and force, heat.

The creation of Static Electricity by friction dates back too far to trace, and has never been of any particular advantage in the arts. Franklin, in his well known experiment of the kite and thunder-cloud, first proved lightning to be identical with it.

Volta's pile, was, however, probably the first arrangement, or battery, ever constructed, which was capable of giving out a constant, steady current of electricity. His discovery of this principle seems to have been, like so many other discoveries which have been of the greatest importance to the world, the result of an acci-

dent. Having placed a small piece of copper on his tongue and a piece of zinc under it, Volta noticed a peculiar metallic taste when the edges of the metals came in contact, and its absence when they were separated. Quick to take advantage of every idea which suggested itself to him in the line of investigations he was pursuing, he constructed his so called "pile," composed of alternate layers of zinc, damp cloth, and copper, and thus was brought forth the first electric battery—since known as Volta's Pile; here was the first constant source of electricity.

The Galeazzi story runs something like this: "One day, Galvani, her husband, was experimenting with a voltaic pile. She noticed that when the wires leading therefrom approached some frog's legs which she was preparing for dinner, a peculiar spasmodic muscular movement occurred, causing a twitching or jerking movement of the same, and thereupon she called the attention of her husband to this seemingly strange phenomenon.

A closer observation of this fact and additional experiments, indicated to Galvani that the Magnetic forces with which the wire was endowed did not reside in the wire itself, but in the space surrounding it.

Acting upon this reasoning, Prof. Joseph Henry, of the Smithsonian Institute, in 1831, constructed the first horse-shoe magnet, which made telegraphy, telephony, and in fact, all of the arts in which Electro-Magnetism is now used, possible. Like Faraday, he displayed the true spirit of the scientist, and was more anxious to discover new facts in Magnetism than to exalt the value of those obtained, "being assured that the latter would find their development hereafter." Thus were important discoveries given to the world, to be afterwards developed into ideas and inventions, which have revolutionized the arts and sciences, as well as the commerce of the world.

In tracing the development of Dynamic Electricity we begin with Faraday. Up to the date of his discoveries, two other means of producing electricity had been known, viz: friction, and the decomposition of metals. But while these methods were available for the generation of light currents such as those required in the transmission of signals, they were altogether too expensive for the production of heavy forces. A voltaic battery that generates electric currents by dissolving zinc with sulphuric acid is an expensive source of power indeed; the zinc (the fuel of the battery) costing more than twenty times as much as coal, and, at the same time only evolving about one-sixth as much heat; leaving out of consideration altogether the expense of the acid.

In 1831, Prof. Henry developed and described the first Electro-Magnetic Motor. This was subsequently modified by different inventors and numerous attempts were made to propel boats and cars by this means, but such attempts all failed financially.

Had Faraday's discovery been developed as promptly as Henry's, the world, to-day, would have known much less of steam locomotion. It slumbered, however, for nearly thirty years; when the subject received a new impetus by the inventions of Pacinnotte and Gramme.

In 1860, Dr. Pacinnotte described in an Italian journal the first dynamo-electric machine; *i e*, a lot of bundles of wire revolving before the face of magnets, with suitable connections. This machine, planned in accordance with the principles laid down by Faraday, when put in motion by an external force induced a powerful current of electricity. The most remarkable feature, however, of this machine was plainly pointed out by its inventor. He found that it was reversible; that is that by applying power to it it produced electricity, or by applying electricity it produced motion or power.

Strange to say this most important discovery passed unnoticed for ten years, when Gramme, of France, re-invented the same apparatus. All practical dynamo electric machines and motors of to-day, are but modifications of the Gramme machine.

These discoveries, as I have said, at once gave a great impetus to the investigation of electric locomotion and lighting. The problem of cheap production of powerful currents of electricity was felt to be nearly solved. Subsequent improvements and modifications rendered this belief a certainty. Suddenly, and on all sides, there was the greatest activity shown in applying and adapting this new force, (new, because for the first time, practical) to the various necessities of civilization. From an expensive and experimental toy, the electric light sprang at once into common and practical use. So cheaply can currents be produced and converted into light that it is now said by excellent authority that 90 per cent. of the energy of the steam engine can be returned into light, by means of the perfect dynamo machines now constructed; a result which would have been hailed with absolute incredulity by the scientists of less than forty years ago. So much has electrical science advanced. Indeed, it is claimed by some of the motor makers that their machines give a proportionate return.

Electrical engineers have done their work much better than steam engineers, but much yet remains to be accomplished. When, in the future, another Faraday unlocks the hidden mysteries of nature and unfolds to us a method whereby the energy stored in fuel may be changed direct to electricity, then, and not until then, will the age of steam pass away.

The laws governing electricity are as well known and immutable as those of gravitation. We know that it falls to the earth on the line of the least resistance, and that it can be confined in conductors which offer less resistance than the adjacent elements. In winding Dynamos with coarse

wire we get a current large in volume, which requires large conductors, but low in intensity; on the contrary, in winding them with small wires small quantity, with great tension (or power of overcoming resistance) is obtained. The former is such as is used in Incandescent Electric Lighting, and is considered harmless. The latter, which is the current used in Arc Lighting (the system in use in this city (is of a more volatile nature and is highly dangerous.

The writer does not know where the dividing line between Static and Low Tension Currents of Electricity, lies. Frictional machines have been made large enough to discharge a spark through the air to a point eighteen inches distant.

The development of Dynamo Machines has necessitated the adoption of standard rules of measurement. A volt meter indicates the tension of a current, whilst the quantity is measured by the ampere meter. A convenient rule for finding the mechani cal horse-power of a current is to multiply the number of Volts and Amperes together, and divide by 746.

What constitutes a safe current is hard to determine. A thin-skinned moist-handed person would be killed by handling wires carrying a current of one thousand volts, while a dry, horny-handed person would not notice the same contact.

Although I have spoken of electricity as being generated from steam power, yet water power is a good equivalent. From a calculation which I made sometime ago, I became convinced that the force quietly going to waste in the Kaw River is sufficient to move all the railroad trains in the states of Kansas and Colorado.

This reminds me that I was to add something concerning Eletric Railroads, and more particularly concerning my developments of the system substituting electric motors for animals. Animal power, compared with steam power is very expensive, and compared with the power derived from electric motors is still more so. It is a fact well known to engineers that the best locomotives, in point of enconomy, are very imperfect and wasteful machines, and it is necessary that they should be such. They must use a large percentage of their energy in auxillary devices. They are compelled to use force-blast, which is a fuel wasting affair. They cannot avoid leaving a track of heat and carbon as they pass through the country. The best locomotives built consume seven pounds of coal to the horse-power developed per hour (many use 15 pounds) while stationary engines are getting common which use less than two pounds. In my system of Electric Railroads stationary engines are used to run a dynamo-electric machine, whose current travels on conductors placed above and near the track. A traveling carriage connected by a wire with the motor on the car, rides on this conductor which is over the track,

and is pulled along by the motion of the car. Thus we get a constant current transmitted to the motor on the car itself, which is exactly similar to the one at the engine house which generates the current. By remembering the description of Dr. Pacinotte's discovery of the reversibility of the dynamo, the reader can readily see that the electric current generated by the dynamo at the engine house, will turn the motor on the car at a high speed. The rest is simple. To connect the motor with the car axles, so as to transmit the force to them, is a question of every day mechanics, with a description of which it is not worth while to trouble the reader. But this is not all. When the car is forced down hill by gravity, the arrangement is such that the momentum of the car turns the motor on board of the same, and causes it, in turn, to produce a current of electricity which is utilized to assist other cars up the grades. Thus as littls as possible of the energy is wasted, and, in fact, I believe that our system returns more of the energy into motion than any other. This is but saying, in effect, that it is cheaper than any other means of street locomotion. This we have demonstrated. The results of our experiments, carried on during the past twelve months, are very satisfactory, and there can no longer be any doubt that, in a very short time, electricity will take the place of animals and cables in propelling street and elevated cars.

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## ATMOSPHERIC TIDES.

As the month of October is, for many reasons, a typical one, it may not be without interest to examine, somewhat in detail, the phenomena which the United States weather maps so graphically picture forth.

The theories in regard to areas of low and high barometer and their tracks are continually undergoing modification. They are very different from what they were five years ago. They have materially changed within two years. In early days a systematic charting of each separate "low" was undertaken. It was believed that by such minute observations a definite track could be determined. This has been productive of excellent results. Beyond such empirical success lies, however, a region of true scientific deduction, that has yet hardly been approached.

The weather map includes the portion of North America lying between the meridians of 20 east of Washington to 50 west and the parallels of latitude 20 to 50. Roughly it is about 3,000 miles east and west by 1,800 north and south. It is too limited for a proper representation of our weather system, but is even now beyond the limits of the means at the

disposal of the signal office to adequately fill out with stations.

The earth at the northern line of this map has a much sharper curve than at the southern line. We may compare it to the shape of a jug towards the neck. We may suppose the tendency of the line of low barometer towards the northeast as exemplifying the same law which would make a string slip towards the neck of a jug if drawn around it and tightened.

Meteorology is easily divisible into climatology and the "law of storm." To the former, tables of mean pressure, temperature, wind direction, rainfall, etc., belong. They are valuable even as tables of life, statistics of production and the like are for special professions. The "law of storms" deals with the atmosphere as a whole or over some portion of the globe of considerable extent; in the present case, the region in and about the United States, as before indicated.

On the first day of October of this year there was upon the weather map a roundish space of about 800 miles in diameter near the upper left hand corner, or northwest quarter, marked "high" and quoted as showing a pressure of 30.20 inches. About a thousand miles to the southeast, somewhere near the Ohio valley, was a smaller but irregular oval, some 700 by 100 miles in area, the longest diameter lying in the same direction, viz: southeast and northwest. It was marked "low," with a pressure of 29.80. It may be unnecessary to state that a difference of four-tenths of an inch in pressure between areas so far apart is not likely to produce any serious disturbance. The actual difference in tons can be easily enough calculated, difference in area also considered, but divided by a thousand miles it would not give a high ratio of local pressure.

From what we know by previous observations, we can formulate a few general laws by which the progress of this area of low barometer may be foretold. Usually the direction is northeasterly, at first of moderate and then of accelerated speed. Cloudy weather will usually be its accompaniment, with possible rain along a certain line. This, over a certain district, with east to southerly winds upon one side, and north to northwest on the other. Warmer followed by cooler temperature, as in the stereotyped formula. To do more than this, we must enter into a region of speculation, and theorize a little boldly. The defect of our weather map is that it covers too limited a field. Looking at the map and seeing the relative positions of the two areas charted, and their direction from each other, we might guess that, as when there is a valley at the foot of one hill another hill is on the other side, so an area of "low" implies areas of "high" upon both sides. Since the "low" is a thousand miles, southeast of the "high" in this case, we may conclude that southeast of this a thousand miles or so is the op-

posing high. It might be farther or less, since the gradient is frequently steeper on one side than the other (and this is an excellent means of calculating the probable direction), but that it exists is almost self-evident. We may satisfy ourselves that it is there in this case by glancing two or three days ahead, say to October 4th, when a well-defined area of high is charted off the Carolina coast. It is almost too well defined upon its seaward side, since no reports could have come from there, but that is a minor inaccuracy.

We wish then to insist upon the fact that this area of "low" lies between two antagonistic areas of "high" that probably the southern area is the largest, that it "outflanks" the northern, so to speak, and that the "jug-neck" shape of the earth conduces to the constantly slipping northeasterly of the low barometer track.

On Oct. 2d, the area of "low" had moved a little to the north and was not very well defined, but began to get squeezed into more marked existence on Oct. 3d, then over the lower lakes with a pressure of 29.60. On the 4th, it was 29 40, its area very much circumscribed and by the 5th, is off our maps at the upper right hand corner. Evidently like the vortexes we see formed in running water there is a tendency to increase of local depth with limits of area. If we go back to the last week in September we can trace this area from the Gulf of Mexico, gradually increasing in definiteness and going off in a swirl like a snapper of a whip.

On October 6th, an area of "high" was near the center of our maps; 30.10 was the pressure. It was of enormous extent, shading off gradually upon all sides. Cool and clear weather generally prevailed. Now the problem is, where is the next "low" to come from? The answer to which is, "upon which side will another area of "high" encroach?"

From the 6th to the 9th, this question remained unanswered. There was but slight change. Then an area of "low" appears in the extreme northwest and another in the southeast. The first developes the most rapidly,—the "jug-neck" again, less distance to travel, line of least resistance, fewer opposing forces,—but vanishes out our of sight north of Lake Superior on the 12th. The "low" to the southeast moves inland, and then during the 12th, 13th and 14th takes its usual northeast course, and so off the map.

Again on the 15th an area of high barometer prevails over the United States, which breaks up slightly during the 16th, 17th and 18th, and partially developed areas of less pressure show here and there, and move northeast.

On the 18th, a well-marked area of low barometer (lying northeast and southwest, oval shaped, 90 by 300 miles, with a pressure of 29.70) is near the center of our map. We conclude that this indicates antagonistic areas of "high" to the northwest

and southwest of it; and on the 19th these appear, the low scudding before it, or seeming to do so, while the high augments in volume, as a rock seems to grow into an island as the ocean ebbs from around it. Oct. 21st to 24th, appears to be devoid of eccentricities. On the 27th, with an area of "high" in the middle of the northwest quarter of our map and another upon the Atlantic coast, there reposes between them a lower pressure over the lake region.

From the 28th to the 31st, an area of low barometer passes from Alabama to New England.

There is not space to more than outline some general modern meteorological generalizations. The distance between areas of high barometers is not over 3,000 miles. As they approach nearer than this the definition of the "low" is more and more marked. They seem to lie over this continent, to each other northwest to southeast; at least the southern area seems to encroach so as to out-flank the northern one to the east.

The direction of the wind at the surface is a matter of minor importance. It does not determine scarcely anything. When the tide is passing through a channel filled with rocks, especially from many points of entry, there will be many conflicting currents. Suppose the aerial sea that surrounds this globe has its billowy upheavals like the ocean? We have proved a polar atmospheric ocean and one at latitude 32, both of superior pressure to that which lies between them. Would there not be found at its line of meeting and commingling, a series of atmospheric vortices which would mark their presence by barometic fluctuations? The southern sea being the larger would give the resultant line of direction. As these vortices moved along this line over areas of low pressure, storm centers would result.

Thus the final explanation of these low barometers will, I think, be found to reside in the theory of atmospheric tides." As birds fly by the variation produced on a single direct motion by the center of their wings, so all the variations in low barometer tracts can be referred to the interaction of waves sent off from the polar and southern air seas. Naturally the transient phenomena is the first to be observed, its measurement attempted, its relative frequency commented upon. Fire was once esteemed a primary element and today it is easier to measure the flame of a burning gas jet than to calculate in advance what the figure will be from an unlighted aperature. A local disease receives treatment in many instances locally, and not as an exhibition of some fault of the system as a whole.

The daily atmospheric tide occurs with great regularity, being high at about 10 o'clock morning and night, and low about four. It does not seem to lay as does the grosser fluid of the ocean, nor give rise to supposed coincidence in its movements

with the rising of the moon. That it is the sun and not the moon which rules the oceans' currents, is at present understood.

This daily tide being admitted we can advance a little farther and say that as at the poles and south of latitude 32, there is known to be a greater density of the atmosphere than intermediately, the daily tide will then have a tendency to accumulate and flow over this intermediate space from both sides but with the stronger power from the southern sea. This "overthrow" or wave will occur about once in three or four days, and would be regular in its action were the conditions causing it, regular, but these conditions not being invariable (notably the inclination of the ecliptic), the line of the interference of the waves of the polar and southern areas will vary continually. There will be a certain periodicity taking one year with another, or, eliminating accidental influences, by comparing a number of years, but the reciprocal conditions will scarcely ever be found. Sometimes the polar "off-throw" will be stronger than usual, and the meeting line will be pushed farther south, and again the northern area will encroach very far upon its northern rival. But if we take the average conditions and show that at certain intervals, the vortex of meeting will be in the northwest, and at other times in the Gulf of Mexico, even with this as a general condition we have made a great advance towards a scientific explanation of the phenomena.

It is probable that the mechanical influences will prove more effective than the dynamical in most atmospheric phenomena. It will be cold with a wind of several days continuance from the north, and warm with the wind from the south, because the air will bring this temperature with it, and seldom from influences due to evaporation, condensation and similar dynamic results of the inter-mingling of air of different temperatures.

But the mathematical formula for thorough elucidation of weather conditions will not be an easy one, nor will it be one that an untrained intellect can successfully complete. In a popular magazine a general idea of atmospheric conditions can be explained sufficiently clearly. But scientifically the problem is only pushed back a little and removed into the hands of a few skilled students of Natural Philosophy.

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## SHAKESPEARE'S CHILDHOOD.

In the early part of the sixteenth century, there lived upon an estate of Robert Arden, at Snitterfield, in Warwickshire, a tenant farmer whose name was Richard Shakespeare. This farmer had two sons who had received at the baptismal font, the names of John and Henry. Of these, the

former seems to have possessed an adventurous disposition; and finding the monotonous life of a farmer too sober for his aspirations, turned his back upon the rural solitudes of Snitterfield, and sought a more congenial career in the parish town of Stratford-on-Avon. His brother Henry remained at home,—content to assist his father's labors during his life-time, and at his death succeed him as tenant of Robert Arden's fertile acres. The impulse that moved John Shakespeare to settle at Stratford was, unquestionably, the same motive which has always impelled unquiet and ambitious minds to uncover their talents to a wider audience than destiny provided them at their birth. "To be of worth and worthy estimation" is the lode-star of such minds; and the contemptuous neglect, or grudging praise, of rustic familiars, forces them into the great world in search of a suitable atmosphere to mature "the blossoms of their fortune." Upon every highway that leads to populous haunts of men the footprints of ambition point townwards; and thither its votaries must go to seek applause for wisdom, wealth, or honor. Allured from obscurity by such aspirations, young Shakespeare found himself, in 1552 an humble tradesman at Stratford, prospering in the accumulation of wealth and rising in the estimation of his townsmen. With the land-hunger so common to those just emancipated from tilling the soil of others, he devoted his first savings to the purchase of real estate—two tenements in Stratford; in one of which was to happen an event more important to England than the birth of a prince or the gaining of a battle. At this time he was a bachelor, and if the antique records of the corporation may be credited, his housekeeping was no more cleanly than that of modern animals of the same species. He was fined, in April, 1552, the sum of twelve-pence for throwing slops in the streets. This was a hint in favor of matrimony that may have induced him to think seriously of a matter which young men are prone to put off, with the call for repentance, till a more convenient season. For some reason, however, his reflections bore no immediate matrimonial fruit, and five years were suffered to pass by before bachelor John exchanged his dirty and cheerless lodging for the domestic comforts of "Benedick the married man."

Robert Arden, of Wilmecote, the landlord of John Shakespeare's father, was a considerable figure in Warwickshire. He owned estates at Wilmecote and Snitterfield and, at his death, his personal property was appraised at nearly seventy-eight pounds—a sum which, at this time, would be equivalent to about four thousand, five hundred dollars. In those days of small fortunes the lucky possessor of such means was placed in a position of great provincial influence and respectability. Indeed claims have been advanced by various writers that the Ardens were of

gentle lineage and connections. It is said that, in times past, the family had shone at court; and that John Arden, Henry the Seventh's Esquire for the Bath, was a relative of the Warwickshire Ardens. Besides there has been found, amongst the Archives of the College of Arms, a manuscript which speaks of the "ancient cote of arms heretofore assigned to" Robert Arden of "Wellingcote" in Warwickshire. But there is no proof that such a blazon even existed and we must be content to look upon him as a yeoman farmer, enriched by industry and thrift and entitled by grace of nature, not heraldry, to "golden opinions from all sorts of people." By his first wife, whose maiden name has not been preserved, Arden was the father of seven daughters, five of whom survived him. Shortly after the birth of her youngest daughter, Mary, poor Mrs. Arden having completed her earthly destiny, "made a groan of her last breath" and left her good man a widower. The lusty old gentleman soon grew tired of celibacy, and, looking about for a helpmeet, fell into the toils of widow Agnes Hill, nee Webb, who very easily gratified her ambition to become the partner of his bed. This occurred sometime during the year 1550,—the period when John Shakespeare left Snitterfield for Stratford. At this time three of Arden's daughters were married. Agnes, having first been married to John Hewyns, was left a widow, but readily secured a second husband in Thomas Stryngер, of Bereley; Joan had married Edward Lambert of Barton-on-the-Heath, and Catherine was the wife of Thomas Etkyns of Wilmecote. Alice and Mary remained unmarried and kept house for their father till the advent of their step-mother; then no doubt, the new mistress of the manse took possession of the keys which had dangled from the trim waists of Alice and Mary and criticized severely the domestic arrangements of the young housekeepers. How, or when, or whether, Alice was relieved from the dominion of her step-mother does not appear, but we find her at the death of her father seven years afterward, still unmarried as well as her younger sister Mary. As for Mary, it is opined that a certain young tradesman of Stratford, had grown to be a familiar figure at Wilmecote on holidays and summer evenings, and that the gossips of the neighborhood were quite scandalized at the possibility of pretty little Mary Arden marrying the son of her father's tenant. It is not likely that the old gentleman himself was pleased at the prospect; at any rate the lovers were not "conjoined in the state of honorable marriage" till after his death.

This event occurred sometime in the year 1557. Bequeathing his "solle to Almyghtye God and to our Bleside Ladye, Saint Marye, and to all the Holye Companye of Hevin," and his "lande in Wilmecote, cawlide Asbyes" to his daughter Mary and remembering his other children

and his wife in less substantial bequests, the prosperous yeoman took his place among the generations who have "trod the way to dusty death." His testament leaves us in no doubt about Mary's place in the estimation of her father. She was still his youngest child; for the second Mrs. Arden had presented him with no competitor to snatch from Mary's brows the crown of love that falls upon the latest born. Yet, despite her youth, she must have shown mental qualities of a superior order; for the shrewd old man appointed her, together with her maiden sister Alice, "ecxequtores" of his will, to the exclusion of their eldest sister and their indignant stepmother. This partiality was no doubt as unpalatable to the Stryngers, the Lamberts and the Etkyns, as it must have been to the Webbs; and we may be assured it was caused by a potent influence to have outweighed the arguments of the nuptial bed, as well as the maturer age and experience of Agnes, Joan and Catherine. Beyond the confidence reposed in her sagacity and discretion, Mary must have possessed her father's most tender love and regard; perhaps the consequence of those amiable traits of character which reappeared in her illustrious son and drew from his associates such reverence and affection.

The estate called Asbies, consisting of a house and sixty acres of land, was not the only dower of pretty little Mary Arden. At his second marriage her father had settled upon her and her sisters the reversion of other property at Wilmecote and Snitterfield, including the farm occupied by Richard Shakespeare. Possessed of such means the young heiress could look beyond the rustic and humble swains of her station and hope for a more knightly lover; but her steadfast and sensible mind fixed itself upon one object and the obscure young tradesman of Stratford found himself, a short time after Robert Arden's death, the master of Mary's maiden charms and modest fortune.

John Shakespeare and his young wife commenced housekeeping in his house on Henley Street in Stratford-on-Avon. Adding the dower of his wife to his own considerable savings Shakespeare was placed in easy and respectable circumstances. After his marriage followed happy years of prosperity and honor. His course of life from his first settlement at Stratford in 1550 until his marriage, in 1557, was of such a character that, when wealth laid upon him its powerful wand, his townsmen recognized in him a man "whose worth and honesty is richly noted." After mounting through several stages of official life, he was finally chosen Mayor, or High Bailiff, of Stratford. This happened in 1568; and for ten years longer his fortunate star remained in the ascendant.

In the meantime John Shakespeare's wife had not escaped "the pleasing punishment that women bear." Having first presented her

lord with two daughters, who died in infancy, she gave birth, some days before the 26th of April, 1564, to the divine child who was destined to make the name of Shakespeare a household word in palace and cot—wherever the gracious influence of letters should penetrate. When his great son was born, the happy father was Chamberlain of the Corporation. He was engaged in business as a glover, in connection with which he marketed the fleece and the flesh of his flock of sheep, and dealt more or less in timber and cattle. He owned the house in which he lived on Henley Street, another on Greenhill Street, besides other properties scattered about the town and vicinity. He had the income from the farm at Asbies and a valuable interest in the share of his wife in the Snitterfield and Wilmecote estates. Notwithstanding such prosperity and the superior talents evinced by the man upon whom it had fallen, the father of William Shakespeare could neither read nor write. Such a man must have felt his ignorance keenly; and who can doubt that he resolved to educate, in all the learning of his time, the boy whose advent graced his happiest and most auspicious days. He possessed for the period of fourteen years after the birth of the poet, ample means to perform this resolve. In 1565 he was elected Alderman; in 1568-1569, Bailiff; in 1571, Chief Alderman and in 1575 he purchased two more houses on Henley Street. From this year his affairs commenced to decline, but he was still solvent and of good reputation until the year 1578. The period within the years 1564-1575, that is the first eleven years of William's life, marked the flood-tide of his father's fortunes; and they did not grow desperate till the poet had reached his fourteenth year. During this time John Shakespeare was one of the most influential citizens of Stratford; and, for some years he was its Chief Magistrate—a position, then, of considerable pomp and circumstance. The eldest son of the first citizen of Stratford must have had better oportunities, in the matter of education and experience in life, than the humbler children about him. He must, at least, have received every advantage afforded by the educational institutions of Stratford. These advantages were far from contemptible. In the reign of the fourth Edward, Thomas Jolyffe had founded in the town one of those parochial schools for the teaching of latin which then began to be introduced into England through the auspices of the Roman Clergy. The school seems to have prospered, for the sixth Edward granted it a charter. From 1572 to 1578, that is from the eighth to the fourteenth year of young Shakespeare's life, the masters of the Stratford Grammar School were, successively, Thomas Hunt and Thomas Jenkins. In those times, a boy was placed at school, at all, in his seventh or eighth year. Before admission it was necessary

that he should have learned to read and write; this was essential as the school did not undertake to give primary instruction. From this fact we may know that the poet received the teaching, for a time, of private tutors, for neither of his parents could read or write. When the quantity and quality of learning imbibed by his son was sufficient, perhaps in his seventh year, John Shakespeare followed the usual custom of prosperous citizens and placed him at school. Who can doubt, then, that from this time until the melancholy year 1578, William Shakespeare was assisted in his studies by masters whose interest it was to devote their utmost care and skill in behalf of the son of the foremost man in the town. The curriculum of the school was limited in range, but thorough in scholarship. It comprised a latin course and the rudiments of scholastic philosophy. By the method then in vogue the rules of grammar were illustrated and enforced by exercises which gave the pupil a practical knowledge of the principles of composition and corrected his taste; and it was absolutely necessary that the laws of verse should receive attention from those who scanned the hexameters of Virgil or the varied strains of Horace. History, mythology, philosophy, were at hand, clothed in the pompous garniture of latin, to reward the student whose inclination led him to attempt their mysteries. Having received the utmost advantage that the school could bestow the student was ready for college; and it is a matter of speculation whether the acquirements of the poet, when he quitted school, would, or would not, have sufficed to open the doors of Oxford or Cambridge to him. There seems no good reason to doubt his fitness to enter the University; indeed it seems quite probable, in view of his advantageous birth and fortune, as well as his powerful and retentive intellect, that he had imbibed "the rudiments of many desperate studies." The love of reading once acquired is as tyrannical as the love of gambling; "keep a gamester from his dice and a good student from his book and it is wonderful." It grows by what it feeds on and it finds new food in the most barren and unlikely places. It reaches far and wide and penetrates into secret nooks and rises to unwonted heights, or sinks below its mean, happy in the midst of travail if its search be successful. Guided by this enthusiastic and omnivorous instinct Shakespeare could not have missed reading the few books at Stratford, in the hands of his schoolmasters and tutors, or the clerical incumbents of the parish. These were for the most part latin classics; but it is not likely that Chaucer and Sackville and Harrington were altogether unknown in Stratford. Perhaps copies of the rude dramas of Marston and Taylor had found their way thither in the company of some traveled provincial or wandering cit; and Ascham's "Scholemaster" might well

find place on the scant shelves of dominies Hunt or Jenkins. Whatever books could be found at Stratford would certainly be within the reach of young Shakespeare, and that he read all he could discover is certain to a demonstration.

At any rate we know he had six years of schooling; and six years of a bright boy's age, from eight to fourteen, is a lifetime for an ordinary plodder. At that age many aspiring minds have presented enduring credentials to fame. Chatterton, Pope, Paschal, our own Bryant, and, in some degree, more lately, the Goodale sisters, have shown that youth and inexperience does not prevent the fair buds of genius from blossoming. Youth and erudition, inexperience and enlightened sagacity, are not so infrequently found in each other's company that we wonder to find them so; indeed as we read of the intellectual exploits of Porson and Spencer and Paschal, when scarcely beyond the years of childhood, our surprise and admiration are tempered by the knowledge that many English, French and Yankee lads exhibit the same proficiency now-a-days.

When Young Shakespeare had reached the age of fourteen years, his father's good fortune seems to have deserted him. His descent was as rapid and disastrous as his rise had been gradual and auspicious. In this fatal year, 1578, Mary Shakespeare's farm at Asbies, was mortgaged and eventually lost; her interest in the other lands alienated; her husband, distracted by the ruin of his fortunes, became irregular in attendance at the corporation; and, so fallen was his estate from its former "high blown pride," he was exempted from taxes for the poor rates, on the plea of poverty, and declared in default on a tax for arms. In this year, or shortly thereafter, young Shakespeare was taken from school. The encroachments of poverty still continuing, his father was fain to reduce the hungry mouths at home by apprenticing him to a butcher. At the age of sixteen all boys are poets, full of fantastical notions, clairvoyant to the most sensuous and riant influences in nature; but the fancy that in a few years was to create a Romeo and a Juliet, and run riot in "Venus and Adonis," must have marked its possessor with a more powerful and enduring afflatus than the *dolce far niente* of puberty. The delicately humane mind that could describe the wounded deer in "As You Like It" with such pathos and feeling must have found the bloody and brutal occupation of a butcher repulsive to the extremest sense. Obeying with reluctance the commands of filial duty the youth exchanged the sweet companionship of letters for the obscenities and brutalities of the slaughter-pen. This was the "bloodiest shame, the wildest savagery, the vilest stroke," that could befall a disposition so full of gentleness and sensibility; yet the experience had its function in developing the universal

mind of Shakespeare. There is a silly tradition that "when he killed a calf, he would do it in a high style and make a speech"—thus finding a congenial atmosphere for the germination of histrionic genius in the fetid vapors of the abattoir. Perhaps in some boyish freak, during the absence of his master, the youth enlivened his grim duties by stabbing Cæsar, or relieving Macbeth of his head, in the person of his bleating victims; but this must have been hysterical amusement at the best. There is more food for tears than smiles in such a story. Like an infant lost upon a battle-field, he may have dabbled his hands in blood and played with the horrors around him; yet the realization of his unhappy situation was ever present. But the black cloud had the usual silver lining. There were holidays and moonlit nights for journeys and boyish escapades in the environs of Stratford. In the company of other youths, as wild and wanton as himself, he may have often scandalized by his conduct the staid burghers of the town, and furnished in himself the model for the future Prince Hal. Yet, while cast by despair into such courses, he could not live surrounded by the lovely scenery of Warwickshire, without developing his natural love for the sublime and the beautiful. The sinuous Avon, winding between grassy banks, redolent with the odors of wild flowers; the Charlecote park and its abundant deer; the surrounding hills, tinted with the delicate hues that nature lends to distance in that climate; a sky almost Italian in brilliancy and the traditions that always hover in the air of little country places, making their heroes, their fairies, their myths and their ghosts so real that even the sober touch of age cannot dispel them, all conspired to form the master genius which was suddenly to spring to maturity. Under these influences the boy grew toward adolescence unconscious of his powers—a foundling Appollo fostered by mortals who could never realize or appreciate his divine superiority.

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## THE ACHIEVEMENTS OF MECHANICAL ENGINEERING.*

GENTLEMEN,—Among the various duties devolving upon the president of this society, is that of saying something at the time and on the occasion of his retiring from the position of honor in which you had previously placed him. With no hope of making up in prating words for any of my previous shortcomings, I accept this duty now devolving upon me, and shall attempt, briefly, to say something about the mechanical en-

*Address of retiring President, J. P. Holloway, to the American Society of Mechanical Engineers at the sixth annual meeting held in Boston, November 10th, 1885.

gineer, his position, and mission.

Brief as is the history of this society, it has already been shown that there was a necessity for its organization and existence, and the rapidity with which its ranks have been filled up, and the character and standing of its members, alike show how widely felt was the want of some nucleus about which the members of our profession might cluster.

Of the advantages that will in the future grow out of the formation of this society it is yet too early to speak, but the benefits that have come to us all by reason of our connection with it, by reading the published transactions, by attendance at its meetings, by participating in the discussions, and, above all, by the pleasant acquaintances made at its social gatherings are, I am sure, not only apparent, but are fully appreciated by all whose good fortune it has been to join in them. The term engineer, is a generic one, capable of being divided into a great many subdivisions; just how many it is difficult to say, as the necessities of civilization, and the advancement of science has made it necessary to add new specialties, each of which is of sufficient importance to occupy the full time and energy of a special engineer in order to master and direct its details.

While I would render honor to all branches of the profession of engineers, and would most certainly underrate none, I cannot but believe that in depth and breadth of usefulness, and for the final consummation, and for those final practical results that best promote the comfort, safety and progress of humanity, the mechanical engineer, by reason of the fact that he, most of all, is concerned in the moulding and directing of the material forces of nature, stands the peer not only of any other engineer but of any other man as well. It was well and truly said by one of the founders of this society, that the profession of mechanical engineering underlies all engineering, and it requires only a moment's thought to make this apparent.

While the civil engineer may plan and locate his railways, canals, aqueducts, bridges or tunnels, it is the mechanical engineer who is called upon to devise the machinery and tools with which they are to be constructed.

The naval or military engineers, guided by the experiences of the generals or warriors of the past, may plan defences by land, or sea, may design forts, or iron-clad ships, but when their resources are exhausted, it is the mechanical engineer who is called upon to build the ships, load them with defensive armour, and to not only provide them with powerful guns but also to provide the mechanism by which not only the guns are to be handled, but by which the ship itself shall be manœuvered and driven, alike through stormy and calm seas.

As an example of the fact that in the prosecution of modern warfare,

the mechanical engineer has become a most important factor, it is said, that during the progress of the late Riel rebellion in the country adjoining our northwestern boundary, one of our engineering firms which manufacture a rapid running multiple gun, with a view of extending their trade, sent an agent with one of their guns to the scene of strife, hoping that owing to the scarcity of troops, and the difficulty of transporting them up there, they would find a market for their machine gun. The agent arrived in camp just at the time when, after a good deal of marching and counter-marching, the belligerents were at last by design or accident brought face to face. With the push natural to an American, the representative of the firm was early on the ground, and running his machine far in advance of the regular troops he unlimbered his gun, and grasping the crank devoted himself to the task of showing what a mechanical soldier could do, and the account said, that, unmindful of the storm of bullets that flew about him from the opposing foe, he turned his crank with such increasing energy that he actually won the battle before the regular soldiers had a chance to fire a shot. While this incident serves to illustrate the value of the mechanical engineer and his contrivances in modern warfare, it is only proper and just to say, that the success in this case was largely due to the pluck and industry of the American drummer who turned the crank.

How helpless would sit the mining engineer above his earth-bound treasures, be they never so rich, did not the mechanical engineers come to his aid to lift them from out their rock-ribbed home, and with fiercely fanned furnace fires free them from their impurities and dross?

Even the giddy goddess, fashion, whose ways none can fathom, would, like Alexander, sigh in vain for other worlds to conquer, did not this same mechanical engineer, like gallant knight of olden time, come to her aid, and with ingenious and studied transformation of wheels, and cams, and flying shuttles, bring new combinations to woof and warp, whereby the silken threads turned into new channels, reveal a hitherto hidden beauty which, for the time, captivates all beholders. And so it is through all the industrial pursuits of life which require for their prosecution the handling and the transformation of crude materials into forms of usefulness and beauty.

While it is true that scientific and technical training is, and must ever be, of great advantage to the mechanical engineer, there is yet another source from which, after all, he will derive by far the most benefit, and that is—experience. Not necessarily his own experience, but the experience of others, and of all ages as well; and I know of no other way that he can be so benefitted, and aided, all through his life.

I ever think of experience as of a vast store-house, the corner stone of which was laid upon that day when the unbarred gates closed behind our first parents as they left the paradise of Eden; a storehouse to which each successive day since that time up to yesterday has added extended length, and increasing stores. In this vast edifice every man of every occupation or profession, has had his nook in which to pile up the experiences of his life. Of the great mass of knowledge therin stored, hidden by the accumulated dust of ages, little has come down to the present, but who does not regret that more cannot be known of the members of our own profession, who in remote ages builded so well that even the ruins of what they accomplished challenge our admiration now. What an addition it would be to the literature of engineering, could we have the clearly interpreted published transactions of these engineers, who, thousands of years ago, built a Suez canal through a country in which in our day DeLesseps could do no better than to follow. Could they be spread before us how much of interest would cluster about the discussions of the mechanical engineers who planned the pyramids, and contrived and executed plans for quarrying, transporting and erecting those numerous obelisks that once dotted the plains of Egypt. Who would not, were it possible, scan with interest the drawings and plans of those engineers of ancient Carthage, who, when Europe was fringed only on its southern limit with civilization, came over to Spain, built pumps, drained and worked mines opened ages before by other and to them unknown engineers.

The steady, onward tread of those Roman legions which once made Rome mistress of the world, was made possible by the labors of the sagaicious and skillful engineers who built for them imperishable roadways, spanned rivers with bridges that are marvels to-day, and who laid so deep, so permanent, his foundations in the then far off "Isles of the Sea," that the engineer of the present, as he excavates for his railways and buildings, often reaches the imbedded stone or crowning arch laid by his professional brother thousands of years ago.

But, not alone would we be interested in knowing something of the experiences of those far off engineers, who in the dim past accomplished so much with so little. We would as well be greatly interested, and greatly enlightened could we know more of those who nearer to our own time have accomplished so much for the benefit of the world at large. While it is true we may go to that garret in Heathfield, where he whom we are now pleased to call the father of the steam engine, James Watts, lived and labored, and may stand beside the bench whereon he worked, may see the lathe which yet has in it the unfinished job he left there, and beside which his leathern apron lies as

last he laid it down, and while all these from their associations would be of especial interest to us all, who know how much the onward progress of the world was hastened by what he accomplished for the steam engine, there will still remain much we shall never know of James Watts and his experiences. None will ever look upon James Watts' scrap heap; one can do no more than imagine of his studying, his planning, his model making, his trials, and his failures, as he worked out the problems of expansion, contrived the condenser, air pump, wave motion, governor, indicator, and indeed every important feature of the successful steam engine of to-day. That he had a scrap pile which received his failures we may well believe, for where is the engineer, who has accomplished anything worthy, who has not hidden away in some secluded nook, or corner, his pet schemes that come to naught, his long dreamed of hobbies which some inexorable law of nature defeated; his neglected but never quite relinquished models, which were to work wonders, and over which at long intervals he sits and dreams, and promises himself at some time in the future to take in hand and work out to a successful ending. That level-headed, canny Scotchman, George Stephenson, who drove the "Rocket" at Rainhill on that September day in 1829, and whose practical, good common sense and industry did so much to make the railway and locomotive of his day a success, has hidden away in his lock-up, in the vast storehouse of which I have spoken, several, need I say unfinished, models of perpetual motions.

It is said of the late Matthew Baldwin, one of the earliest and best known builders of locomotives, one whose practical good sense, industry, perseverance, and long-accumulated experience contributed more, perhaps, than that of any one else in bringing the American locomotive to its high degree of efficiency, that all through his life he was haunted with an idea that a rotary engine could and ought to be used for propelling a locomotive; and, no doubt, that in his pencil sketchings, among his models, and in his scrap corner during his life, might have been seen here and there the outcrop of a hobby which in his dreams and in his leisure moments rose up before him like Banquo's ghost, and which, like it, in spite of all his failures, "would not down."

Since time was young, it has been the mechanical engineer, working often in the most obscure manner and in the most humble circumstances, who in the end pushed rapidly forward the car of progress.

While it is possible, by the aid of history or tradition, to trace back to their origin some of the innumerable inventions which have so benefited the world, how many yet remain about which nothing is now or ever will be known. Think for a moment of that vast host lying in unknown

graves, who in the past, amid poverty and discouragements, toiled from early morn until the night was well spent, in some obscure garret, or smithy, or workshop, to devise and perfect some simple machine, to contrive or manufacture some article now so common, so universally used, that its sudden removal would work a world-wide injury. While none will question the value of the engineer in aiding the progress of the past, all will, I think, agree that at no time in the history of the world was he so important a factor as he is to-day.

Standing in a city whose enlarged culture and great wealth was made possible by, or indeed is the direct result of the labors of the mechanical engineers, who by their skill and industry have filled all the valleys of New England with flying Spindles, busy wheels; whose ingenuity has relieved all labor of its drudgery, and whose inventions have given their country a world-wide renown, I need not, I fancy, speak at large of the mission of the mechanical engineer, or of what he has accomplished.

A stranger standing in the midst of the glories of Westminster, asked to be shown the memorial or monument of the builder. He was told: "Would you see the monument of Sir Christopher Wren,—gaze about you." So answer I. Would you know the mission of the mechanical engineer,—gaze about you wherever in the civilized world you may be.

Putting aside all the wondrous history of by-gone ages, blotting out all the engineering triumphs of the middle ages, calling the time of Shakespeare, and Milton antiquity, and coming down to within a brief century, or if you will, to the brief span of a single generation, and what, or rather what not, has the mechanical engineer accomplished. So broad, so varied, and so universal has been the field of his action, and of his triumph, that I find no time to begin even an enumeration of what he has done. A thoughtful woman gazing at the ceaseless, steady action of an immense engine, driving with tireless speed the ponderous steamship through storms and calms, said half in soliloquy, but wholly in earnest, "Engineers ought to wear crowns."

While it is true that at least in this country the position of any man or set of men will be what they themselves make it, it is nevertheless a fact that the public at large are wont to accord eminence and praise to those most in view, and oftenest heard. In the history of the olden time it was the kings and rulers who occupied much of the attention of the public. Later on, and for a much longer period, it was the chieftain, or warrior, whose praises were sounded by the orator and poet, and the prowess, the bravery and chivalry of the Knight Errant, surrounded with environments of waving pennons, floating banners, and glittering armor was the theme of poetry and song through many ages.

Hannibal and Napoleon, with their armies, crossed the Alps. Their

pathway amid the clouds was strewn with thousands upon thousands of those who fell by the way, and of the proudest armies who at their base began the ascent, comparatively few reached the sunny plains beyond.

They had indeed crossed the Alps, but behind them their snowy peaks defiantly touched the clouds, unharmed, unconquered. Long years after these warrior chieftains had crumbled into dust, another, mightier than Hannibal or Napoleon, came to the foot of these rock-barred barriers, which for the ages past had defiantly said alike to king and peasant, "Pass me only at your peril." With no long retinue of soldiers, no vast caravan of horses and elephants, and bleating herds, no waving banners, no blare of trumpets or cry of herald, came the conqueror of our day. Seeing the weary traveler and burdened beast climbing with patient toil along the narrow pathways, and about the storm-beaten crags half hidden in the clouds above him, and beside yawning gulfs no eye could fathom, he bethought him of a better way. Seeing near by a rushing torrent, which for ages had unconfined, tossed high in the air its flakes of foam, he knew he had in that a giant force to do his bidding, so, curbing and guiding its wild spirit, he bade it turn his wheels, swing his cranks, move to and fro his ponderous plungers and pistons. He made swinging valves at each opening stroke to gather in that wildest, freest and most untamable of all elements, one of which it was said long, long ago, "It bloweth where it listeth"—the air—and driving it before him through long and tortuous passages, he made it to knock with arm of steel upon the portals of the hitherto impenetrable walls. You know the rest, with highest skill, and unceasing industry he bade the spirits of the air, and water, alike to his behest; guiding them to the right and to the left, up and down as occasion required and from either side, through months and years, until at last the hitherto defiant walls are broken down, and the eager men leaped through the rent mountain, not to engage in deadly conflict or savage hate, but to clasp each other in bonds of equality and fraternity. Through this open portal, to-day, on roadway of steel, luxurious carriages glide swiftly and securely, filled with the inhabitants of all lands, on errands of peace, pleasure and good will. Other vans loaded with the product of the field and vine, the spindle and the loom, alike pass from Italy's sunny plains to the north land of snow and ice, for barter or exchange.

Need I ask who conquered the Alps, the soldier, or the engineer? Need I ask whose triumph has contributed most to the welfare of all the world—the generals who went over the Alps, or the engineer who went through them? Let Mont Cenis and St. Gothard answer.

The day of the professional warrior, the swash buckler of camps, whose sword was on hire for any cause, has

passed forever and he is fast dropping out of sight. That there are, and it is to be hoped ever will be, men who for their country's defence, and for the cause of right and justice, will peril their lives on the field of battle, we fully believe. 'Twas such a one who, but a short time since, was borne to his last resting place, followed by a nation in mourning, and, for whose requiem tolling bells, beginning with the early dawn upon our eastern coast, awakened new echoes in every town and hamlet across the broad continent, until with the setting sun they died out amid the murmuring waves of the Pacific.

As the comrades in arms of this great man came together to devise some memorial that should perpetuate his worth and keep his memory green, with one accord they said, let not his monument be of broken swords, and captured guns, with all their attendant memories of conflict and strife, but rather let the sculptor with his highest art and best skill, transfer to the enduring marble the semblance of the great citizen, sitting in the shadow of his home, and under the shadow of an impending fate as well, facing calmly death, which, baffled on a hundred battle-fields, held him now within easy reach, tortured with a pain we can but at best imagine, using his last hours and waning strength in writing a memoir; not to place himself higher on the rolls of fame or in the hearts of his countrymen, but to leave behind him comfortable sustenance for the family he so much loved, and from whom he was soon to part. This sentiment of his comrades, the officers and soldiers of the Grand Army, and which so accords with the feelings of all who admire the kindness of heart, the inflexibility of purpose, and the absence of all vindictiveness of the great warrior, and greater citizen, General Grant, illustrates most fully the change in public sentiment of which I have spoken; and illustrates, as perhaps it never so well illustrated, the truth of the saying that "the pen is mightier than the sword." And let me add, that among the pens that have accomplished mighty results for the progress of civilization, liberty and equality, is the drawing pen of the mechanical engineer.

There remains but one more thought to which I beg your interest and indulgence, and that is the position of the mechanical engineer with regard to his fellows. It is not many years ago since, when the mechanical engineer knew far more of the men of all professions than he did of his own. It was not many years ago that the leading members of our profession knew but little of each other, except by reputation, and I disclose no secret when I say that there was little endeavor made to do away with the exclusiveness and distrust, to use no harsher term, that to a certain extent was prevalent then. Happily all this is changed now. The formation of this and similar societies, the frequent meetings of conferences held

the comparison of methods, the recitals of our successes, and the avowals of our failures, together with the knowledge that has come to us all by reason of this interchange of views and experience, makes us all to feel that we live in a wiser and better age.

But not alone in a professional way have we been benefitted by these gatherings. The harmonious union of men, standing high in the attainments of their profession, high in the regards of the public; representative men in communities spread all over the land, by such meetings as this, held in the important industrial cities of our country, in each of which their best citizens have come forward to greet us with most cordial welcome, there has been shed a new luster upon the profession of mechanical engineering, and it has been raised to a still higher plane of usefulness and observation. But better than all, by these meetings we have come to know each other, as in no other way would it have been possible. In this acquaintance, we have been taught a broader charity for each other's feelings; we have come to know something of each other's trials and misfortunes, and to find on every side warm hearts, filled with generous impulses ready as well to give as to receive.

Let it be our ambition to so conduct ourselves that we shall ever honor our calling, and shall assist in raising it in the estimation of all to that high position of honor and usefulness to which, by reason of what it has done, and is doing for the world and humanity, it is so justly entitled.

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## GOLD MINES AND MINING IN CALIFORNIA.

The auriferous territory of California is so extensive, the deposits so numerous and diversified, the implements and methods employed in working them so various, and their development in such different stages of progress, that in writing about these things, one can, in a mere letter, treat the subject in only a very general way. To enlarge upon or even mention idividual properties, enterprises, or localities, is out of the question; some brief remarking on the above, more general topics being about all that can be done.

Proceeding, then, to deal with these topics in the manner indicated, it may be observed that the business of mining for the precious metals in California is in a fairly prosperous condition, being active, remunerative, and progressive in nearly all of its departments. In the matter of correcting former mistakes and purging this industry of its many abuses, much has been accomplished, winning to it the support of certain classes who before would have nothing to do with it. Owing to diminished water supply, the snow-fall having

been light on the mountains last winter, the

HYDRAULIC MINING

season has been a short one; the water in many localities having already given out, this being about a month earlier than usual. As this scarcity of water will stop also a few of the quartz mills, the annual bullion product of the State would have suffered some shrinkage had not this loss been made good by increased yield from river-bed operations, which, through the occurrence of a low stage of water early in the summer, gain just to the extent that these other branches of mining lose by reason of a dry season.

Despite injunctions, a good many of the hydraulic mines continue to be run, their owners finding means to evade the restraining process of the courts. The most of these mines are operated under leases obtained by the Chinese, who, through recourse to their peculiar methods, manage to escape arrest, or, if arrested, manage, by these same methods, to keep their leased claims, and also those they purchase, running all the same. In a few instances, the whites have also, under one pretext and another, been able to continue gravel washing, the plan usually adopted in these cases being for the responsible parties to keep out of the way.

THE WAY THE HEATHEN CHINESE DO IT.

By the Chinamen, however, a different course is pursued. If the process-serving officer, arriving on the ground, wishes to make an arrest, he is permitted to do so; that is, if he can find out who among a herd of jabbering pagans is the proper man to arrest; for he cannot take the whole gang into custody. If the minion of the law hangs around and persists in making trouble, some one in the lot is pointed out to him as the "boss," who, thereupon, is seized, carried off and locked up in the county jail, where he is suffered to remain, it not being the policy of his masters to bail him out. He does not, in fact, want to be bailed out. Why should he, seeing he is leading what, to him, is a life of luxurious ease —the public boarding and lodging him better than he ever was boarded and lodged before, while his employers allow him his usual wages as long as he is incarcerated? To fine the prisoner, as might be done, would, of course, be a farce. The plan of arresting the entire working force at a mine has not been adopted, as this would only be making matters so much worse. The responsible parties in these cases consist of moneyed men or laborers having money, and who associate themselves together for the purpose of leasing this class of properties, which under the circumstances, they are able to do on very easy terms. Once in possession, they know that, by recourse to the above methods of procedure, they can continue work without serious interruption. The expense and trouble they are put to in thus de-

feating the law and baffling the orders of the courts they do not mind in the least, as these companies, getting the mines all outfitted and in working order on very low terms, invariably make large earnings.

So far, the authorities have not been able to find any way of dealing effectually with these violaters of the law, and, failing to do so, there is danger that this class of mines will ultimately fall into the hands of these foreigners exclusively. In this event, besides the heavy loss entailed on the original owners, it would happen that none but Chinese labor would be employed in working them, while all the gold taken out would be shipped directly to China, there to remain. Such a result being imminent, it is highly probable that the Legislature of this State will, at its next session, take such action as will enable the owners of these enjoined mines to resume work upon them, having first built suitable dams and other receptacles for holding the coarser and more damaging portions of the *debris*. That they will be permitted to experiment farther in that direction is almost certain. The conditions favoring the retention of this material up near the mines have been every year improving, and are now such that it could be very effectually there retained by the means proposed. This would be relegating the question to the basis of Judge Temple's decision, afterward overruled by Judge Sawyer, who denied the mine-owners the privilege of making trial of reservoirs and dams. With Judge Temple's decision the miners would be content, building the impounding structures at their own expense. Were this course adopted, it would lead to a final if not altogether satisfactory disposition of this vexatious business; at least, so far as the farmers and miners are concerned.

It should be stated that not all the hydraulic mines in California have been enjoined by the courts from running. Only those in the more central tier of mining counties have been so stopped; in other words, those that outlet into the American, Bear, Yuba, and Feather rivers and their tributaries. Those located in Trinity, Siskiyou, and Del Norte counties, which discharge their tailings into the Klamath and its confluents, have not been molested, nor is it likely they ever will be, as none of these streams are navigable, nor are there along them any lands or other property, rights, or interests exposed to injury by this waste material from the mines. Though not conducted on as large a scale as are many of the enjoined properties farther south, the hydraulic operations along these northern rivers are quite extensive, and, by reason of the favorable conditions that obtain here, promise to increase both in magnitude and number. Besides exemption from the *debris* troubles, the country here is well supplied with water, which short and inexpensive ditches suffice to carry on the mines. The auriferous

gravel is tolerably abundant and of good grade, and, being but little cemented, and free from volcanic capping, can be worked effectively and cheaply, there being nearly everywhere fall enough to insure all needed dump. Looking over the field, there seems enough to warrant the conclusion that hydraulic mining, whatever inherent and extraneous obstacles it may have to contend with, is nevertheless destined to have a long life in California. The present annual output of these mines amounts to about two million dollars, less than a third of what it would be had not their production been so restricted by the action of the courts. As premised, the present is likely to prove a good year for

RIVER-BED MINING,

a business that was formerly carried on along nearly all the larger gold-yielding streams of the State, but now confined mainly to the Trinity, Scott, Klamath, and Salmon rivers, the little continuing to be done elsewhere being mostly by the Chinese. This, up to the time the rivers became depleted of their treasures, was a very remunerative and, therefore, very popular style of mining. Afterward, it fell to a low ebb, having been given up pretty generally to the Chinese. Of late years, it has experienced some revival, and when the several tunnels driving to receive and divert the water at points where the rivers make short curves, thereby laying bare long stretches of their beds, shall have been completed, there will be taken from these reclaimed portions of the streams such quantities of gold as will, in the estimation of those engaged in projects, tell sensibly on the gross product of the state. The river-beds in California will continue to be worked, for a time, at first with increasing and then, no doubt with gradually diminishing returns. The day of their final exhaustion is afar off—too far to much concern the present generation.

DRIFT MINING.

Through a general avoidance of the mistakes, very common and very disastrous during its earlier stages, this has come to be a tolerably safe and profitable branch of mining. It is pursued mainly along the channels of the Pliocene rivers, and under the table mountains in the more central portions of the State, where a good many enterprises of this kind are carried on, some of them costly and of great magnitude. While Forest City, in Sierra County, and the Damascus Divide, in Placer, remain prominent centers of drift mining, many other localities are coming into note, the partial suspension of hydraulic operations having imparted quite an impetus to this branch of mining. While the deposits adapted to be best worked by drifting are very extensive in California, their development will proceed slowly, as it takes time as well as money to explore and open them up. Thus far, they do not appear to have recom-

mended themselves to capitalists, nor are they likely to do so in any special manner. Experience has, in fact, shown that they can be worked to best advantage by associations of practical miners, all the marked successes in the drift diggings having been achieved by companies of this kind. The gold product from this source is estimated at between three and four million dollars a year. It will, in the course of a few years, be considerably larger. The various

OTHER BRANCHES OF PLACER MINING,

such as hand and ground sluicing, working the beach sands and the seam diggings, re-washing the tailings, etc., all continue to be practiced in California; now, of course, for the most part, only in a small way. In the winter, when water is plentiful and free, ground sluicing is carried on in many localities. In the summer, some of the gulches are worked over, the bed-rock being dug deeper and the banks washed further up. Schemes for moving and washing over the tailings that in great quantities have lodged in the mountain ravines are in progress; Slate Creek and Shirtail Canon being the sites of the most notable projects of this kind. Since the partial stoppage of hydraulic mining, some of the water before used in piping is employed in washing ground with which nothing could before be done in summer. The two large companies that own Gold Bluff, the strange deposit on the seashore, go on collecting much gold by the novel methods here practiced for thirty years or more, while small companies of miners, mostly "squaw men," contrive to make small wages washing the auriferous sands found along the ocean beach farther north.

And thus it is, the gathering of gold from the California placers goes on, their aggregate yield continuing quite large, notwithstanding that the world had come to believe these placers were depleted to the point of abandonment long ago.

It is, however,

THE QUARTZ MINES

of California that are to prove her most prolific and permanent source of gold production. Having in a previous letter alluded to the increased interest taken in quartz mining in this State, it will suffice to say now that such interest continues unabated, being kept alive by the favorable condition and outlook of this industry in all parts of the State. In the depression, now so prevalent in most other lines of business, is to be found another incentive for our people to turn their attention so sharply to this branch of mining. In the field, work goes on very briskly. Prospecting is active, leading to the discovery of valuable lodes all over our auriferous territory. These finds are followed up very generally by development, and this again by reduction-works, of which a good many have been erected within the past year or two, some of them be-

ing of large capacity. As a rule, however, the old error of putting up mills too big or too soon is avoided. Out of this awakening to the subject of quartz mining, there has grown a corresponding interest in the means to be employed for reducing this class of ores. As a consequence, the inventors have been busy, and numerous are the new mechanisms and processes claiming the attention of the mining public. As many of our miners are men of limited means, and many of their lodes afford comparatively little ore, a small, cheap mill of improved pattern has come to be with them a desideratum. Among other machines claiming to fill this want is the Wiswell pulverizer and amalgamator, an improvement on the old mill and a Boston invention. It is simple, cheap, and durable, and appears to be doing good work; but if it wins at all, it will have to win on its merits, the average California miner being prejudiced against any thing having its origin abroad.

One of the special fights that is waged in this province of invention is that directed to supplanting the old-fashioned stamp by something more cheap, simple, and durable. While this end has not yet been attained, it is by good judges believed that it soon will be. That some gains have already been made in the business of beneficiating this class of ores in California, may be inferred from the fact that a great deal of quartz is now worked here with profit that does not pay over four or five dollars a ton; whereas, twenty-dollar ore was at one time rejected as worthless. While the yield of gold from this source will be somewhat larger this year than last, it will be yet another year or more before these presenting greater activities in the business will be made manifest in a largely increased production. The value of the gold taken from the quartz mines of California the present year will reach, and may possibly exceed, eight million dollars.

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## THE ESQUIMAUX.

The winter life of the American Arctic native, or Esquimau, is much more interesting than his summer existence, which partakes so much of the general life of savages with a few uninteresting changes, while in the winter time we have a mode of life so radically different from that of any other people, by their peculiar environment, that the first travelers among them to describe these strange details were looked upon as Munchausens of the greatest breadth of imagination. Houses of ice and snow, the very last thing in the world that a person would take to make a comfortable abode anywhere, were reputed to be their winter habitations.

They lived on raw frozen meat in a temperature where it would be agony to any one else not to have their meal hot and steaming; and so on through social economy, leading a perfect life of social paradoxes.

By most ethnologists it has been claimed that this strange nation found itself in its frigid land as a result of national weakness, "crowded to the wall" as it were by superior races, and that wall a wall of ceaseless ice. I am a firm believer in the opposite, or that the Esquimau finds in the North his most congenial clime, and we find to corroborate this the perfect contentment of the people with their country, their hesitation in leaving it for however short a visit, their longings to return when absent; many other reasons show that they are naturally natives of the north land by their own choice and not that of others. They are no more held to the rim of the cheerless Arctic Sea by other races than are the musk-oxen by the buffalo, or the polar bear by the grizzly. That they are more than satisfied with their cold country and its phenomenal low temperatures is amply shown, I think, in their preference for their winter life over that of the summer, although their struggle for an existence is much harder then, as viewed from our point of hardships, in the terrible exposure and oft recurring famines, for which they seem to care but little. Now let us take a look at that winter life in the light of one who has lived as an Esquimau for over two years among them, for every one will admit that some additional light is needed, so little do they have in the winter season.

A few premonitory frosts commence in the Artic fall, generally followed by a blustering northern storm of snow snd sleet, and then with a sharp snap the thermometer sinks to the minus twenties and thirties and the Arctic winter is upon them, and as the schoolboy dialect would have it, "for keeps too." This varied from early September to late October in my travels, occuring on King William's Land at the former time in 1879, and in North Hudson's Bay at the latter in 1878. This sudden onslaught of the winter does not drive them at once into their peculiar houses of snow, glad as they would be, however, to avail themselves of such an abode; for the first snows that fall are not of the right texture for this Arctic architecture. Fully forty degrees below zero must have been reached and a number of fierce gales must have "packed" down the autumn snow before it is of the proper consistency, or *sec-tu-u-ad-lo* (heavy) as the Esquimaux call it, to be cut into the curious blocks or huge bricks of snow with which they make their snow-house; (*igloo* of the Esquimaux) looking so much like the old-fashioned pictures of bee-hives with their oblate shape. Their skin tents are altogether too cold to live comfortable in them long before that time comes around, and the Arctic carpenter is driven to another curi-

ous material for building to keep out the bitter cold, and that is the pure ice from the many fresh-water lakes and ponds with which their country abounds. When about six inches thick they cut out slabs about the size of an ordinary house door, put them upright on their ends, joining them edge to edge, making a little circular pen of ice about ten to fifteen feet in diameter, over which they put the summer tent for a roof. These houses of ice are as transparent as glass, if clear ice has been formed, and when finished one can look through and see what his or her neighbors are doing without the trouble of getting down on his hands and knees and crawling in to find out. These glass-like houses thus completely kill all incentive to gossip, as an essential element thereto, ignorance of the person talked about, is wanting. I am pleased to add however, that the malicious variety of this trait is wholly unknown among these distant people.

The house of ice, while warmer than a skin tent, will not compare with one of snow, and as soon as this material is of proper texture, an *igloo* or snow house is constructed. I will not dwell on the construction of the *igloo* to any great extent, further than saying it is the shape of a half egg cut perpendicular to its axis, and about six to eight inches thick in the blocks, which are about thirty inches long by half as wide. The most common errors regarding the Esquimau snow-houses are, that these big blocks are laid flat, when they are really on their longer edge, and that they form one course above another, like we build a brick building, when in fact, there is but one course, spirally twisting around from bottom to top. While the blocks are but six to eight inches thick, the *igloo* is often made four to five or even eight to ten times as thick during very cold weather, by a banking of loose snow thrown over it.

Of course the temperature can not get above freezing in these homes of hard snow, or the structure will commence melting and eventually tumble in; but it must be remembered that a person can soon get used to a temperature just a few degrees below freezing, and even be quite comfortable. I must say that after a person has gotten thoroughly acclimated to the out-door winter life of the Arctic, a temperature of 20 deg. to 32 deg. Fahrenheit is every bit as comfortable as one of 70 deg. to 80 deg. to a person coming into the house from a temperature well below freezing. I distinctly remember one curious effect on the white men of my party during the cold of the first incoming winter. Every one has probably felt the loss of managing power in the fingers when numbed with cold, and inability to write or button or unbotton a coat or other garment, or anything requiring considerable manipulation and play of the fingers, and we, of course, were no exceptions to the rule at first. Being constantly in this temperature, however,

and almost as constantly exercising our fingers under these disadvantageous circumstances, I was greatly surprised to see how rapidly these functions of the fingers were restored, until by time the winter was over they were actually as perfect as ever in any temperature, however cold, and this too, despite the fact that there still remained, as before, the disagreeable sensation of cold in them at times. It seemed as if the motor and sensory nerves could be made absolutely independent of each other, and this benefit, which allowed me to thread a needle and sew below freezing, to use a sextant for observations at minus forty degrees Fahrenheit, or clean and insert cartridges in a magazine gun at even twenty degrees lower with ungloved hands, I believe I still, to a certain extent, retain, although all others accruing from Arctic acclimatization have disappeared in my five years away from that zone.

If a comfortable house made of ice or snow seems singular during intense cold, how absurd an enjoyable bed made of the same material must appear; and yet their bedsteads are made of snow, the mattresses of many layers of musk ox and Polar bear robes and undressed reindeer skins, while the sheets are dressed reindeer robes and the covers of the same material, their pillows being their reindeer clothing rolled in a bundle at the head of the snow bed. Here, stark naked, with only one reindeer skin over them, they will sleep as soundly as a farmer in more favored climes after a hard day's work, and that with the temperature out of doors so low that every breathing thing is enveloped in a cloud of its own making.

The amount of cold these northern nomads can endure, however, borders on the phenomenal. I have seen the little babies, two and three years old, perfectly naked, for hours at a time, on the reindeer robes of the bed in the *igloo*, the temperature, as I have said, being constantly below freezing; and in the fall I have seen them naked, playing and splashing in a pond of water, long needles of ice forming on the quiet place. I once saw an Esquimau baby boy taken from its mother's hood, and naked, made to stand on the snow until she found its reindeer skin clothing from the sledge, a fairly strong wind sufficient to drift the loose snow along with it, blowing at the time, the thermometer minus thirty-eight degrees, the only protection it had, being behind a sledge loaded about three feet high, around and over which the wind poured. Its exposure thus was a good minute, and to appreciate this one must take a watch in his hand, and see that length of time drag by, a time that a not unconscientious but sensational writer might readily jot down as five or ten minutes. And I have known a naked man, surprised asleep in his *igloo* by a polar bear, hastily grasp a gun and pursue his enemy two or three hundred yards in the snow, the ther-

mometer fifteen to twenty below zero, and slay him. These Esquimaux rub slushy snow, dipped in water, on the bottom of the runners of their sledges, with the open palms of the hands until it freezes into solid ice, the thermometer being from zero to seventy below, when I have known it to be done. I have seen an Esquimau throw himself on the snow and rest comfortably for half an hour, the thermometer seventy-one degrees below zero, or one hundred and three degrees below freezing; and probably doing some light work with ungloved hands. The Kinnepetoo Esquimaux who seldom build even the small fires of the native stone lamp in their *igloos* during the very coldest weather of winter, are probably the hardiest of all these boreal tribes in withstanding low temperatures, and sit around in their cold cheerless snow-houses with only their undergarments on (the Esquimau has two suits of reindeer skins, the outer with the hair turned outward, and the inner with the hair turned toward, and resting against the body) their arms withdrawn from their sleeves and resting on their bare bodies across their breast, chatting all the while pleasantly about various matters, the thermometer often being below zero; in fact, the only warmth the snow-house has is that given off by their bodies. I have known one of these Kinnepetoos to take an undressed reindeer hide that had been soaked in water, to remove the hair, which was frozen stiff as a plate of boiler iron, put the same against his naked body, and not only hold it there till it was thawed out, but until it was perfectly dry, so as to use it for a drumhead (*Kee-low-tee*) in their peculiar savage rites. In fact, I might say that I have been naked myself in a temperature of minus sixty-eight degrees, during the short time it took to undress, roll my reindeer coat into a bundle for a pillow, and crawl into my sleeping-bag; but my movements partook more of the character of a small boy going to a base-ball match than one sawing wood.

Their most efficient method of keeping warm seems to be in the enormous quantities of fat they devour, and especially during the winter season, and of which so much has been written that I will leave the subject for others not so well understood. Their clothing made of reindeer skins throughout, I have sufficiently, though very briefly, described above in brackets. Persons looking at pictures of polar people clad in these swarthy furs, think from their bulky appearanee that they must be quite heavy, but I think they are lighter than our winter suits at home. They are certainly lighter than any other clothing in the world called upon to protect their owners from such intense cold.

A most peculiar fallacy of Esquimaux winter life is that, when they are living in these odd little snow houses, and wrapped in furs and subsisting on fats, that their lives are a

sort of hibernation, as near as human beings can be supposed to hibernate. On the contrary, the very reverse seems to be the case, and it is by far their liveliest season, despite the fact that their days are much shorter, and all conditions, as we would view them, much more unfavorable for any great amount of active out-of-door-life. I do not believe I exaggerate when I say, that for every mile they travel in summer, with their *kiaks* (little skin canoes), or on foot over the land, they can show from a dozen to a score in the winter with their dogs and sledges. They kill more game in this season, and their long evenings are by far the most lively in their acrobatic and superstitious exercises.

A book could be written without exhausting the winter life in Esquimaux land, but I have tried, in my small space, to give some of the most interesting themes thereon, and above all something new and beyond the hackneyed subjects of other polar travelers.

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## THE STREAMS OF WESTERN KANSAS.

An inspection of the map of Kansas discloses the fact that the streams of the western part of the State are divisable into two systems. These are the northern, or Kansas river system, and the southern, or Arkansas river system. They are separated by a somewhat irregular line whose general course is east and west through the middle of the State.

Of the branches of the northern system, the Republican, the most northern branch, is a far larger stream than either the Solomon, the Saline or the Smoky. The most important of the smaller tributary streams of the north are also in the Republican region.

Of the southern system, the Arkansas river, after crossing the west line of the State, flows for about one hundred and fifty miles without a single living tributary, and, until after passing the middle of the State, it receives only three small streams, viz: Coon Creek, Pawnee Creek and Walnut Creek. Along the Indian Territory line, Western Kansas is drained by the Cimarron, a branch of the Arkansas, and its tributaries. The great number of these tributaries becomes strikingly noticeable about the one hundredth meridian, or the longitude of Dodge City; and from this east, the streams indicate an abundant water supply in our southern counties.

This distribution of the streams of Kansas leads naturally to the interence, if the inquiry be carried no farther, that the northern and southern portions of the western half of the State have better supplies of water than are accorded to the central belt.

An examination of the character-

istics of the water courses, and of the country they traverse, renders questionable the correctness of this assumption.

Turning to the streams of the southern system (I have not yet extended the inquiry minutely to the northern system), the Arkansas river may be taken as somewhat typical. It is a broad river, whose banks are from three to eight feet high, and whose waters run rapidly over and through a bed of course sand and gravel, the particles of which mix and roll with the muddy water. Where it leaves the Rocky Mountains, the Arkansas is a rushing torrent, which at all seasons discharges a considerable volume of water. Its fall in Kansas is from six to eight feet to the mile. Its course is nearly east until near the midde of the State, and then it is southeast. The depth of its gravelly bed is not known. Borings have been made at Sterling to a depth of about fifty feet, and it was found that the gravel became coarser as the boring proceeded; and at about fifty feet below the river-bed the sand-pump failed to work, being unable to receive and hold the coarse sand.

Throughout the Arkansas river valley, wells sunk to the level of the river bed reach the same character of gravel and an inexhaustible supply of water. When the Atchison, Topeka & Santa Fe Railroad track was laid along the upper Arkansas valley, the working force consisted of about three hundred men and two hundred and fifty horses. Camp was made at noon, and at night. The supply of water for these men and horses was obtained by driving down at the successive camping places a small gas pipe with a perforated point, and attaching a pump to the top. The depth from the road-bed to the water was, in most places, about six feet. The abundance of this water supply is further illustrated by the pumps of the sugar works at Sterling and Hutchison. The amount of water required for condensing the vapor from the vacuum pans is immense, and is supplied by powerful steam-pumps, working continuously day and night. The water raised by one such pump is about what would flow through a four-inch circular orifice under a head of one foot. To obtain this supply, a few perforated points are driven into the gravel and water beneath the soil, and connected with the suction-pipe of the pump; and they never fail to furnish an abundance of water.

In the southwestern counties, the country rises into an elevated table-land at varying distances from the Arkansas river. Wells are made in these high plains, by boring, as it is believed, to a level with the bed of the river, where gravel or sand and water are encountered very much as at a less depth in the valley. These borings reach the water in the country southwest of Dodge at a depth of about one hundred and ten feet. Exceptional places are found in which water has not been reached at a depth even of two hundred and fifty

feet. In these places, a dry clay, impervious to water, is encountered. Some wells have been bored through this clay, in which cases the water has risen to within one hundred and fifty feet of the surface. The question now arises. Does the Arkansas flow under the entire southwestern quarter of Kansas.

Now turn to the Cimarron river, two branches of which enter the State near the southwestern corner, and unite a short distance west of one hundred and first meridian. After uniting they disappear beneath the surface, and are seen no more for fifteen or twenty miles, and then reappear a larger stream than when they sunk away. In times of freshet the overground stream is continuous over all parts of its course.

Another stream, called by the old plainsmen White-woman Creek, enters the State in Greeley county, crosses Greeley and Wichita, and disappears about the middle of Scott county. It is stated that this stream flows over the surface during only a portion of the year. At no time, however, has it any visible outlet; unless, indeed, it may be considered the headwater of Walnut creek, which rises, an unfailing stream, in Lane, the county next east of that in which the White-woman disappears.

Other less conspicuous examples of disappearance of streams might be noted. Indeed the Arkansas itself has, in the central part of the State, several times, within the observation of the writer, become, to all appearance, a bed of dry and drifting sand. But an abundance of water was always found at a short distance below the surface.

It is stated that from the time Texas cattle were first driven over the trail to Dodge City, the coy-boys experienced difficulty in preventing stampedes at a poinf in the southern part of Ford county. Rumbling noises even are reported to have startled the bold cow-boys themselves. Subsequently, it is stated that a circular portion of earth, variously estimated at one hundred and fifty to three hundred feet in diameter, sunk, leaving a great hole down to the water's level, about one hundred feet below the surface. The water is intensely salty; and an enterprising settler has erected a windmill, and is pumping the salt water into troughs, from which the sun and wind carry away the water, allowing the salt to crystallize. Further east salt-springs and salt-streams become numerous; and in the Indian Territory, not far south of the Kansas line, are great salt plains of the Cimarron river. No direct investigation has yet been made to determine the existence of a current of water under this vast country. But every inquiry lends confirmation to the belief that a large portion of the moisture precipitated upon the eastern slope of the Rocky Mountains, together with that of the plains themselves, finds its way quickly through the porous soil to this preamble gravel, and through this proceeds slowly in a

broad, deep stream under the plains of Kansas. And before concluding that the middle belt of the western half of the State receives less rainfall than the country north and south of it, it will be well to compare the extremely open soils of the middle with those of the other parts; to make some geological comparisons; to ascertain whether the streams of the north and south may not be the springs fed by the rains of the middle portion; and, finally, to compare records of rainfall, when such records shall have been made.—*Prof. Cowgill.*

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## PNEUMONIA AND OZONE.

Since the beginning of this year there has been a severe and very fatal epiedmic of pneumonia in this city, from which many of our most eminent citizens have died. Several of the leading physicians have stated that the deathrate from pneumonia this year has been much larger than that of the cholera in the year 1854.

As so much solicitude has been felt and expressed by the doctors and by the public at this sudden increase of death from pneumonia, I have thought that it was desirable to undertake a systematic study of the bearing of meteorology upon it, and see if there could be detected any connection between the weather and this disease in the city of New York. On comparing many thousands of observations from the self-recording barometer, thermometers (dry, wet, and sun), hygrometer, anemometers, and pluviometer, with the mortuary statistics, there could not be found any continuous connection between these observations and the prevalence of pneumonia. But when ozone was taken into consideration, there was found to be a very close connection between its observations and the deathrate from this disease.

In the following table is given a summary of the deaths from pneumonia, the amount of ozone, and the number of days on which ozone occurred for the months of January, February, March, April and May for each year from 1878 to 1885 for the city of New York:

| YEARS. | DEATHS. | OZONE. | NO. OF DAYS. |
|---|---|---|---|
| 1878 | 1304 | 9.50 | 73 |
| 1879 | 1409 | 10.88 | 65 |
| 1880 | 1490 | 12.39 | 75 |
| 1881 | 1804 | 12.84 | 101 |
| 1882 | 2056 | 16.19 | 86 |
| 1883 | 2061 | 12.73 | 85 |
| 1884 | 1608 | 6.45 | 48 |
| 1885 | 2308 | 13.26 | 87 |

On an inspection of this table, it will be found that by the records of the Health Department of New York City there were for the first five months in the year 1878, 1304 deaths from pneumonia, while the observations at this observatory give 9.50 for ozone on 73 days for the same months. In 1882 the deathrate had increased to 2056 deaths, and the ozone to 16.19 on 86 days. In 1884 there was a decrease in the deathrate to

1608, and also in the ozone to 6.45 on 48 days. In 1885 the deathrate from pneumonia increased to 2308; the ozone had also increased to 13.26 on 87 days.

Having studied the observations thus far, the two following questions appeal to our attention.

(1) *What is ozone?* (2) *Can ozone produce pneumonia?*

For more than half a century scientists have been endeavoring to answer the first question. Some of them have called it "electricized oxygen," "allotropic oxygen," "active oxygen," "excited oxygen." Berzelius expressed the opinion that ozone was oxygen in a peculiar state. Becquerel demonstrated that oxygen may be converted into ozone by the prolonged action of electricity. By a majority of modern experimenters it has been admitted that ozone is an allotropic condition of oxygen, similar to that which may be assured by chlorine, as was shown by my father, the late Prof. John William Draper, M. D., of the New York University, and an account of which was published by him in a memoir entitled, "*Allotropism of Chlorine, or its passive and active states*," in the year 1845. Ozone like Chlorine possesses powerful bleaching, disinfecting, and deodorizing qualities, and in a concentrated form both these gases are very destructive to animal life. According to Schonbein, oxygen is capable of assuming three different conditions, viz:—two contrary active states, and one passive. These have been named respectively ozone, antozone, and neutral oxygen. But why oxygen should assume its active or passive states little is known. My father found that the indigo rays of the solar spectrum could produce in chlorine the active condition. May not these same rays produce the corresponding state in oxygen?

In taking daily observations on ozone at this observatory, Schonbein's iodide of potassium and starch papers have been used, and also the iodide of calcium and starch papers. I have noticed that on some occasions, soon after the papers have been exposed to the atmosphere they change to a decided brown color, while after a few hours this brown color nearly disappears. On dipping the paper while still brown into water, the blue color of iodide of starch is given. This shows that antozone has been present in the atmosphere but has not had time to destroy entirely the ozone effects produced on the paper.

We come now to the consideration of the 2nd question, viz:

*Can ozone produce pneumonia?*

As to the causes of this disease, very little is known. Sometimes no cause at all can be traced. Very often it is supposed to be the consequence of exposure to cold, especially when the body has been previously heated by exercise. But why such exposure should in one person cause pneumonia, in a second, pleurisy, in a third pericarditis, and in a fourth, peritonitis we cannot tell.

If, as we have seen in considering the first question, oxygen has the power of assuming different forms, one of them preservative, another destructive, may it not in one or other of these forms produce inflamation of the substance of the lungs, etc., thereby causing their engorgement with blood not properly arterialized? I think it might be well for physicians in their treatment of pneumonia, or its allied diseases to consider whether these diseases may not be due to ozone or antozone, and whether it may not be possible to neutralize the evil effects of one form of oxygen, by the use of the other. The further question arises whether the administration of pure oxygen to patients may not be the very worst treatment. It is well known that the oxygen of the atmosphere is mixed with about four-fifths of nitrogen.

I regret to see that so many meteorologists neglect the taking of ozone observations, because they are not satisfied with the results obtained. I think that the day is not far distant when we shall know the exact influence of ozone upon disease, and if it should be discovered that in other cities, there is the same connection between ozone and the deathrate from pneumonia, and its allied diseases, as there seems to have been in this city for the past eight years, shall we not have made the first necessary step towards mitigating the evil results of this disease upon human life, as well as its disastrous effect upon cattle under the form of pleuro-pneumonia.

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## CONCERNING CLUBS.*

A club was man's first weapon. The stout cudgel with which the primitive man killed a bear for his dinner was not more essential to his existence, than was that association with his fellow savages by which he secured protection and support.

And, as States matured and became well organized, such associations, for the promotion of some common object, multiplied and broadened their sway, until they have at last found recognition as important factors of human progress.

In no way, perhaps, is our age more distinguished from those that are past, than by its higher appreciation and wider application of this principle of association.

So far has the work of organization and subdivision been carried, that there is no place without its clubs, and no work that is not done, or attempted by them.

Under high conditions the club becomes mainly social and intellectual in its character and aims.

An example of such a club, and a most beautiful one, is found among the ancient Greeks. Imagine the

*A paper read before the Social Science Club of Kansas and Western Missouri.

rapture of a noble Athenian boy when admitted to his first symposium. How proud is his step; how glow his cheeks; how throb his pulses; how flames his ambition to acquit himself worthily. One could willingly be counted 2,500 years old next birthday to have shared his transports.

In the Greek symposium the young student or statesman was met by questions that challenged his reason and sharpened his wit.

The rising poet and painter and philosopher were encouraged there to present each his best work or thought; and criticism, keen but kind, prepared him for contact with the world. There wit more sparkled than wine; and odes of Sappho, and ballads of Anacreon, the sweet-voiced lyre and sweet-eyed musicians, filled and thrilled the young heart with poetic fervor. Dainty viands and rare perfumes, and softened radiance of light and color, less than glorious paintings and perfect statues, warmed the imagination and entranced the senses. There the beauty of lofty thoughts, and the sublimity of great deeds fired the eager youth to highest endeavor.

Since those ambrosial days, the club has assumed all phases. The French Academy, at its palmiest, when only a back parlor circle of literary friends, and before it had to bear the oppressive honor of Richelieu's patronage, was the very perfection of a social and intellectual club. The conversational power and grace; the swift, keen wit; the perfect dignity and discipline, combined with sweetness and polished familiarity with which its half dozen members entertained each other, have since enchanted the whole world, and have constituted it an ideal to be longingly followed, if never quite attained.

In London, "The Club," as it was invariably called,—for its members would not stop to identify it by any distinctive title—the haunt of Johnson and Goldsmith, of Garrick, and Gibbon, and Sir Joshua Reynolds, was famous—how justly so, we all know. But it lacked that spirit and refinement which the presence of cultivated and gifted women alone can bestow. That it was denied their gracious influence, and that all clubs, after this time, gravitated toward social and even animal enjoyment, to the neglect of the intellectual, was a misfortune for which Johnson must bear somewhat of blame.

"A club," said Johnson, "is an assembly of good fellows meeting under certain conditions." And other good fellows, accepting this vague definition, allowed the conditions to become more and more uncertain, until good-fellowship was the only point left worth insisting upon.

Of the fifty and more clubs which sprang up in London about this time, those where good things were said—not merely swallowed—became exceedingly rare.

These were all gentlemen's clubs, in the sense that no ladies were ad-

mitted, and had their fitting place in coffee houses and taverns. Such of them as are still extant, have improved in many ways. These occupy imposing buildings, and possess every convenience and luxury of a perfectly appointed home, including valuable libraries.

Clubs after this model are found in all our larger cities; but they have never become quite popular.

The American gentleman is more domestic than the English, and not so culpable.

In so far as these, or any clubs, undertake to furnish amusement for men or women, apart from their families, and from each other, and to fill up those leisure hours which should be given to the home, they aim a blow directly at the unity of the family, and are vicious in their tendencies. But these tendencies are so remote from us as scarcely to merit a passing allusion.

Among us, intellectual society inclines to the formation of study clubs, that is, of regularly organized companies, meeting at stated times, for associated study and criticism. These study clubs, though never so sharply defined but that each shows a shading of the other, and many show a blending throughout, are yet clearly divided, by the dominant motive, into two types. In clubs of the first type, the main object is individual culture; in those of the second, it is public improvement.

An association of the first type, and one that is almost purely individual in its work, is the "Society to Encourage Study at Home," or the "Boston Home Course." The name of this woman's club expresses its aim. It wishes to supersede desultory reading with systematic study; to give to girls and woman an opportunity to complete at home an unfinished education. And it offers them a course of instruction which is broad and deep, as well as elegant. The monthly examinations, conducted by correspondence, are critical, and even severe; but these are accompanied by suggestions so full of kindness and wisdom that the student is encouraged to persevere.

This Boston home course begins its thirteenth year with widening influence, and with increased opportunities for doing good. More than 200 teachers are engaged in the work, all volunteers; and its students found in every state in the union, number many hundreds. Not less than 12,000 letters pass between these teachers and pupils every year. The club possesses an extensive loan library, also, to which additions are canstantly being made.

One other good thing it does; it sends to each student a health tract —preaching the responsibility of woman, not only for their own health, but for the health of the home, and encouraging household work as a proper balance to intellectual work.

The Chautauqua movement, with its classes of 800 in Japan, its branches in South Africa, and its circles in every city and hamlet of our

country—is phenomenal. One hundred thousand students are, this year, counted in its ranks, and more than 1,000 have already graduated. Nothing could be more significant of the widespread appetite for culture than such a success for such an enterprise. It is one of the most promising ig ns of the times, one of the strongest of many hints of the democratic tendency of learning, and of the insufficiency of the old time methods of college and university to teach the masses.

The Chautauqua course of study has been much criticised; it has been called superficial and pretentious; and is charged with making literary upstarts rather than hard workers and deep thinkers. And some of its text books are perhaps compilations suited for hasty rather than thorough work. But to the multitudes who must do hasty work or none at all, it gives that outline acquaintance with the world of letters and the wonders of science which makes them at least appreciative readers and listeners. Much smattering, it may be argued, is far beneath a little real education. But among the ever increasing myriads of things which it were good to know, we sometimes feel like admitting, with Gail Hamilton, that we would be thankful to be "well smattered."

It is undoubtedly true, also, that many who would hesitate to attempt a more exacting course, acquire, by means of this, a taste for knowledge which ultimately leads them into deeper study. The *Chautauqua Press*, of Boston, is constantly issuing works prepared expressly to meet the wants of the club; and its late productions —notably those in the departments of literature and natural science—show marked improvement. Its late appointments,, also, show its more liberal tendency and the great Chautauqua flood, as it grows wider and deeper, is submerging its old narrow land marks, and sweeping away old superstitions.

The smaller study clubs which everywhere abound, and in which many of us are personally interested, are all of this first type,—being chiefly concerned with the intellectual pleasures and advancement of their individual members.

The Concord school of philosophy —a study club, in a wide sense—should be, it would seem, a perfect example of the first type, since its aim is purely philosophical.

But speculative philosophy gasps for breath in the material atmosphere of the nineteenth century; and the modern school of Athens, with Emerson as its Socrates—Emerson, "the fire of whose genius was love for humanity," finds that it is philosophy as applied to the problems of life, that compels its profoundest research.

If it would found an American school of philosophy, it must make that philosophy practical; it must be the doctrine of life, the art of living nobly and well. It must send to the nursery better mothers; to the

schools and colleges better teachers; to the government offices better statesmen; and to the pulpit better interpreters of the sacred book.

This is its declared purpose, and to it we all respond, amen! and may the seven years of our Concord school of philosophy be prolonged to seventy times seven.

Sorosis, the pioneer woman's club of America,—17 years old last March—had, as its first and only ostensible object, the promotion of useful and pleasent relations between women of literary tastes. But those brave, earnest, strong-souled and strong-minded women, who made the early Sorosis what it was,—Frances Power Cobb, Alice and Phœbe Carey, Emily Faithful, Lucretia Mott, and others possessed a gift of helpfulness which mortgaged them to all humanity.

There was healing in the hem of their garments; the multitudes pressed upon them, and would not be kept back. Their own large-heartedness, also, forced them to supplement more purely literary work with the discussion of the proper field for work for women; the best way to aid women; plans for labor schools; the moral, as well as mental education of girls; homes for unfortunate women; foundling hospitals, and hosts of kindred subjects. These discussions opened the way to wider fields of usefulness, and to a higher, grander womanhood for the whole sex.

The organizations claiming Sorosis as their parent are many and helpful. And we, who are here to-day, have somewhat for which to thank Sorosis, in that we, as women, are growing stronger, braver, freer, more noble, more patient, and more womanly.

The second type—the club whose aim is wholly beneficent—has many glorious representatives. They are devoted to the discussion of subjects of the first importance—political, economic, social, ethical and philanthropic, and represent the most earnest, thoughtful, and progressive element of our age and country.

Such is the American Social Science association, which this year celebrated its twentieth birthday. Among the members of this great club, are many who are workers also in one or more of the associations already mentioned—men and women whose names are household words to us; and many others who have done valiant work in its ranks, have gone beyond. One of its earliest members was General Grant; that good citizen, who hated the deadly art by which he rose to fame; who sought neither dominion nor glory, but peace alone, and the welfare of mankind. The introduction of definite instruction in the social sciences into so many American colleges and universities is directly due to the efforts of this association. At Williams college, at the University of Michigan, at Harvard and Cornell social studies are being pursued with surprising zeal and thoroughness. This is matter for rejoicing to all who realize how vital is the necessity that the studies of our young

men and women should bear more strongly on the problems of American life.

The American Social Science association, with its many branches, the Society for Ethical Culture with its many branches, and kindred organizations which are springing up everywhere, down to our own Social Science club of Kansas and western Missouri, which, if it has not many branches, has many and deep roots, these form one band of workers, hand-fasted in a common cause—the good of humanity—setting themselves to study the facts and laws of the social order without prejudice or bias of any sort; aiming ever at the prevention of evil, rather than at its cure; striving patiently to learn what is, and to promote what ought to be.

In our strong, forth-putting, irrepressible, young American life, where bold and bolder investigations are constantly being made in every department of knowledge, new social and moral problems are every day confronting us.

Crime and the treatment of criminals, pauperism and practical charity, the elevation of the working classes, temperance, sanitary science, the adulteration of food, work and women, the just relation of the sexes, duties of parents and children, these, and other questions are pressing for answers.

It may be that our club stands at the foot, the youngest and weakest member of the great national class in the science of society; but not for this reason shall we escape our share of the responsibility. Many of the questions are peculiarly our province because we are women, and it is our sisters who ask. We must answer the young mother who sits at home, rocking her babe upon her breast, and turning wide, glad eyes to us for guidance. And that other mother whose streaming eyes and shaking hands implore our aid in winning back a wayward one. There are vaguely dissatisfied souls—useless, but yearning to be of use—to be turned into paths of unselfish helpfulness, and everywhere, discordant hearts to be attuned to harmony, and inspired with a loving enthusiasm for all that is good, and true, and beautiful. For our encouragement, we may remind each other of the successes of other women. The recent Woman's Congress at Des Moines, and the Woman's suffrage association at Minneapolis, have breathed inspiration through the whole country. And, at the anniversary of the American Social Science association, the most salient and incisive discourses, those that awakened the deepest interest and most thorough discussion, were given by our clear-headed, great-hearted, public-spirited women. God bless them!

Since these discussions are forced upon us, how best can the work be done?

First of all, by keeping ourselves as a club in the best running order.

We possess one requisite of success

in that we began small, and have attained to our present proportions by a natural growth. A rapid growth, truly, from the original twenty to the present 375 members, in the four and a half years of our existence, but still a growth that is vigorous and healthy. Another promise of success is that we are perfect in harmony; and still another that we appreciate the importance of the work before us, and are earnest to give our best selves to its accomplishment.

Every member is here responsible, not only for the assigned duty, but for the general harmony and interest. A full realization of this responsibility fosters enthusiasm, without which there is no grand success.

It were well if we were content to make haste slowly. Better for us, surely, is one subject carefully presented and thoroughly discussed, than a passing glance at many. We praise this paper, and that, as "so suggestive;" but what use do we make of these good suggestions? Theoretically we go home with our tablets full of them; theoretically we study them all toilfully, and apply them all conscientiously. Practically they are dropped, with a sigh, into the great mental waste basket where all good suggestions go. We are everywhere haunted with the reproachful ghosts of good suggestions; and must we here increase that grisley throng? Why not do the little that we can, thoroughly and well? that we may carry away, not the shadow, but the substance of things hoped for.

A high sense of honor requires, in a club, a deep subsoil cultivation, that its early-ripe fruit may be a fine scorn for anything like the shirking of a responsibility, great or small. One woman possessed of inflexible integrity and reliability is of more value than many geniuses. All may not realize the power of those homely, old fashioned virtues, patience, perseverence, and promptitude; but, verily, the executive committee knoweth that their price is above rubies.

A degree of moral hardihood is also a goodly possession, so much as suffices to the utterance of any honest thought. Also a little—just a little—callousness to criticism.

We may have confidence, always, to speak our best thoughts. It is a God that dwells within, and all should do it reverence. Reticence is a thing to learn as well as eloquence. After reticence, comes calmness, and patience, and tact, and unfailing kindness. Also, respect for individuality, sympathy with all honest endeavor, however crude; and triumph in each other's success.

Such clubs as ours, are, as they should be, free from all thought of caste. It is not to be believed that the accident of position ever affected the status of any one here, where all meet with a common interest in the common good.

Many a soul, shut in by circumstances, or by its own sensitiveness, longs for such sympathy and companionship as we here enjoy. If our

club does in any measure broaden and sweeten life for one of these, or if it sends one weary soul upon its way, once more glad, and strong, and patient, it has given a fair excuse for being.

Finally, let us begin and end with faith—faith in ourselves, faith in each other, and faith in the advancing, wide-sweeping, uplifting wave of a better civilization.

So shall we study the science of society with the earnestness of hearts consecrated to the work; gaining ever a fuller appreciation of life and its duties, staunch ever to the fealty that we owe to each other, to our sex, and to the world; growing ever into a closer sisterhood, and a more perfect womanhood.

# EDITORIAL.

## CONTEMPORARY FICTION.

The literature of our day is something entirely *sui generis*. The historian, the biographer, the essayist, even the poet, as well as more didactic publicists, write for an audience very different in education and in activities from that addressed by writers of the last, or even of the first part of this, generation. Historians must present something else besides chronicles of battles, policies and national achievements; they must display a knowledge of the social forces which underlie events and be prepared to square their speculations with the generalizations of modern science. It is the same with the others. What is it that gave Tennyson's "In Memoriam" such triumphant popularity? Obviously, as a mere elegy, it would have dropped into the limbo that such poetry usually reaches and merits; but strung upon the light theme of private grief, like pearls upon a worthless thread, Tennyson presented the generalizations of science transfigured into poetry. Probably no essayist of the day surpasses Mathew Arnold in celebrity; but, despite the beauties of his style, the chief value of his productions lies in the fact that his ideas are in harmony with prevailing scientific views. As for political economists, social theorists, even homiletical writers, they must conform to the current of scientific opinion also, or else see their pages go back to the paper mills.

The chief requirement of the modern reading public (I mean the enlightened, informed public) is, that the books it is asked to read must have plot, theme, moral, all subservient to some phase of sociology, psychology or other scientific generalization. It cares little about the matters so dear to the hearts of our fathers.

It cannot be supposed that fiction would remain unaffected by a motive so universal in its influence. On the contrary, it is profoundly affected by it. The novels of George Elliot, of Henry James, of Alphonse Daudet, are not only different in degree, they are different in kind, from the novels of Dickens, of Hawthorne, of Victor Hugo. They are, as to these, what the comparative-anatomist is to the empirical physiologist, What does it matter whether the book ends with a marriage or not, whether or no vice is punished or virtue rewarded? The author knows that these features are adventitious, and, whatever he may conclude to do about them, the result of his work must stand the test of scientific appraisement.

Yet it does seem that style should not be entirely forgotten, that the charm of a refined and elevated rhetoric should not be entirely sacrificed to the supposed requirements of scientific precision. In truth our foremost writers of fiction are guilty, not alone of this

fault but of one of much worse tendency in its effect upon the future of letters. This is euphuism—a rude, rustic fault that one would expect to see confined to the hastily prepared columns of the daily newspaper. As an instance, take the installment of "The Princess Casamassima, in the November *Atlantic*. One would scarcely expect to read the following from Henry James: "Peter Muniment took a match out of his pocket and lighted it on the sole of shoe; after which he *applied* it to a tallow candle which stood in a tin *receptacle* on the low mantle-shelf. This enabled Hyacinth to *perceive* a narrow bed, etc., etc. "Several months after Hyacinth had made the acquaintance of Paul Muniment, Millicent Henning *remarked* to him that it was high time he should take her to some place of amusement." * * "She tossed her head and *remarked*, that when a young lady had done" etc., etc. Of course the match was applied to the candle, if it was lighted—but what was the use of going this bold and round-about way to say that Peter Muniment lit a candle? Why, too, say *receptacle*? The receptacle might have been a tin cup or a tin can, or a tin pie-plate, and surely there was no need of mentioning the fact at all if the picture of the candle was to be left so confused in our minds. Why not say it was in a tin *candle-stick*? The word may be vulgar and common, but certainly not more so than *receptacle* seems to be as it is used. Why, again, should Hyacynth *perceive* so long as we have a verb to see? If Miss Henning had *said* the words put in her mouth instead of *remarking* them, no doubt they would have been quite as interesting and characteristic.

This fault seems to be deep-seated in Henry James' manner of writing—it is hardly a style; and it is a strong voucher of his strength and genius that, in spite of such a grave blemish, he has taken such an exalted position in the ranks of novelists. While he remains true to the painstaking, scientific method of constructing his stories, his writings would gain vastly in strength and beauty, if such school-boy phrases were omitted from his books.

## A CRITIC CRITICIZED.

It is sometimes amusing to come across instances of misapplied wisdom—wisdom so oracular and consequential that we are reminded by it of the homiletic discourses of the learned and valiant Hudibras. An example of this kind of wisdom appears in an editorial in a late number of the *Popular Science Monthly* under the title "Party Government." The inspiring cause of this effort seems to have been a sentiment uttered by Senator Hawley, of Connecticut, during a recent address; this sentiment is as follows: "It would be a lamentable day indeed for this country, or any other enjoying a free government, when it could be said that there were no parties—that lovely time that some long for, when there should not be enough of moral or intellectual life among the people to get up a single difference of opinion upon political affairs."

At this the *Monthly* inflates its learned nostrils, curls its intellectual lip and wrinkles its superior brow with indigna-

tion. Agreement in truth, it cries, is the supreme end, and Senator Hawley must be a very wicked partisan, a vicious and selfish agitator, a grovelling office seeker and political adventurer, if he thinks political disagreement a useful factor in governing men!

Now what nonsense this is and how unjust the aspersions upon the motives of a man who is, beyond cavil, a pure and honest patriot. Who doubts that the end of honest discussion is truth? that is, relative truth. None but the most enthusiastic and self-satisfied sciolist will assert that a single principle in natural science is settled into an axiom; we can only say that the tendency of thought and experience is in a certain direction and, therefore, we believe *that* to be the direction toward which our investigations and theories must tend in search of truth. Whether or not there will ever be a time when the so-called generalizations of science shall no longer be attacked or defended, is a matter of speculation; what we do know is that every useful application of these generalizations must come through the fire and shock of discussion.

But the absurdity of expecting an utopian age for politics, when all discussion shall end and the whole community settle down into universal agreement on all questions of political science, is too palpable for argument. It will be a millenium indeed when the lion of republicanism shall lie down with the lamb of democracy, and all the other *itions* and *isms* and *cracys* swallow each other, so that there shall be no more discussion, no more disagreement, no more change of opinion, no further increment to political knowledge.

If politics were a science at all it would be a science of expediency. What is expedience? must always be the prime question in politics. Whether the protectionist or the free-trader; the greenbacker or the specie-maniac; the monometalist or the bimetalist; all appeal alike to the selfish propensities of human nature. If these propensities were all governed by the same pursuits and passions, it might be possible to adjust them under one general principle; but so long as men's activities are directed into diverse and adverse channels, it is silly to dream of a time when one policy will suffice for a whole community, and men cease to wrangle over forms and policies of government.

This being so, the uses of conflict and discussion are manifest. What is expedient does not become palpable at first acquaintance. Indeed no other question is surrounded with more difficulties and perils. Even those who are most glib in formulating sociological doctrines are the least able to put successful schemes of government into operation; as witness the failure of John Locke with the Georgia colonists, and the more recent fiasco of Thomas Hughes in Tennessee—setting aside the Brook-farmers. There can be no cast-iron rules, no unchangeable regulations, because human society is never stationary, and every advance or retrogression, or change of aspect, must be taken account of in political science. This involves discussion. If it were possible to conceive of a state of human society so perfectly developed that no

further change could occur,—a time when every individual will think and act precisely like every other individual—there would be also presented the spectacle of stagnation, decay and death.

Thus Mr. Hawley's sentiment, so far from branding him as an incendiary villain, thirsting for office and political triumph, really states a just and useful maxim. Whatever exceptions may be taken to the form of his statement, historical science places it beyond a doubt that discussion and progress walk hand in hand; while the closer mankind approaches to agreement on great subjects, we can confidently look for stagnation and dissolution. The Roman church, having the same opinion as the *Monthly*, sought to make all men of one opinion several centuries ago and the result was the Dark Ages. Let us hope that no such *doctrinaire* notions will ever again plunge civilization into a Slough of Despond so difficult to escape from.

## A FEW OBSERVATIONS.

It is quite excusable in the promotor of a magazine, as it is in the projector of a railway, or a bank, or a barber-shop, to make public the testimonials and recognition his venture receives from those most capable of judging its merits. The REVIEW has certainly received its full share of praise and notice from press and public. Beginning with the London *Journal of Science*, our exchanges have vied with each other in the kindly rivalry of encouragement and good will. In the above mentioned periodical for November, there is a notice of the REVIEW, over two pages in length, presenting its merits and calling attention to the varied and interesting character of its contents. In another place the same magazine urges the people of *Kansas* not to let the REVIEW fail for want of patronage. This is all very pleasant coming from such a far-distant source, without friendship or self-interest to prompt it, and we hope the citizens of Kansas will profit by it.

Another very kind notice comes from Dr. Bowers, of the *Pacific Science Monthly* and *Ventura Free-Press* (California); another from the *Iron Trade Review;* another from the *Jefferson City Tribune;* another from the *Photographic Times;* all influential periodicals.

Prof. Otis T. Mason, in the *American Naturalist*, speaks of the REVIEW as "one of our best sources of information respecting the Archaeology of the Missouri region," and regrets very much to hear that there is danger of its discontinuance. Similar sentiments are expressed by Prof. Romyn Hitchcock of Washington, D. C., Prof. T. Berry Smith of Glasgow, Mo., Prof. Popenoe of Manhattan, Kas., Mr. C. E. Putnam of Davenport, Io., (Prest. Acad. of Sc.) and many other eminent authors and scientists.

Perhaps one of the most cordial endorsements the REVIEW has received, appeared in a recent number of the *Missouri School Journal*, an admirable and ably conducted paper; for the REVIEW is commended by it as "one of the best magazines published." This endorsement is doubly grateful on account of the high standing of the *Journal* and its freedom from the vice of

awarding honor when it is not due.

The editorial head is far from being turned, however, by these evidences of his success. The gratification of personal vanity is very poor pay for the labors and expense of publishing a magazine of the size and pretensions of the REVIEW; and while this moral support is pleasant to the heart it is unsatisfying to the pocket-book.

During the ensuing year, we intend to keep the REVIEW up to its present standard at least. If it is possible to increase its sphere of usefulness and interest we will do so. If it has to die it shall go down with colors flying and not meanly dwindle into insignificance.

## NOTA BENE.

The patrons of the REVIEW, are respectfully requested to send in the amount of their subscriptions to the present volume, (Vol. IX), that is, those who have not done so. It is requisite that this should be done early, as the publication of a magazine in Kansas City is not, *per se*, a means of gaining an independent fortune. Once for all we must confess that if our object in continuing the REVIEW had been a mercenary one, there would be little encouragement to go on with the work. This however, was not the object. We desired to keep alive an enterprise which will grow, with increase of time and growth of public spirit, into something admirable enough to deserve financial, as well as moral support. Of the latter it has had full measure—in fact there is scarcely a day that does not bring letters commending the REVIEW, and urging us not to weary in well doing.

We do not wish to gather laurels or gold in the endeavor, but while we devote much time and toil in the venture, it is only fair that the public should help us by subscribing for the REVIEW. We will vouch to parents that its contents will be more interesting and valuable to the young, than any book that can be purchased for the subscription price.

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OUR religious exchanges are full of controversy over the aspect the church should present toward evolution. It seems that professors in several southern theological seminaries have been teaching doctrines closely approaching Darwinism and, in consequence, have found anything but "ways of pleasantness" and "paths of peace" among their respective brethren. Science and religion should be mutual helpers, and it is absurd in this age to keep up the world-old conflict between creeds and progress. Let us all admit that truth cannot suffer, in any event, by discussion, and that intolerance is the most formidable barrier between us and knowledge.

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A SOCIETY for Psychical Research has been organized in Kansas City, of which Mr. James Scammon is president. The committees have been appointed and are engaged in pursuing the lines of investigation suggested by the experience of the various societies in England and the United States, formed during the past two years. It is also intimated that a Theosophical Society will soon be organized. Thus, Kansas City has at last been reached by the wave of Occultism.

## CORRESPONDENCE.

EDITOR KANSAS CITY REVIEW:

Originality is not the vice that affects most writers. But in the Kansas City REVIEW for October and November, Mr. Nathan Kouns, has contradicted Herbert Spencer, in an article wonderfully original, both in manner and matter. He very strikingly declares that Augustine, Calvin and Spencer have committed the grave error of supposing that the law of cause and effect applies to the moral nature of man. The repetition of this old error by the last named gentleman, is much "more pitiable and inexcusable" than its original expression, because Spencer "seeks to bind moral or spiritual truths by physical laws." This is not merely original; it is admirably clear. Everybody knows at once what is meant by this statement. A physical law is a relation of co-existence—or it is a relation of sequence. Now, Mr. Kouns means to say that Mr. Spencer seeks to make a moral or a spiritual truth exist along with something else, or in consequence of the prior existence of something else. It is very "pitiable and inexcusable" in Mr. Spencer to seek to do this, and it is absurdly unscientific. It is true enough that when courts inquire into the commission of crime, they very foolishly regard the motive or cause of the act as quite important; but courts are not scientific. It is also true that all people in all ordinary judgments, about all sorts of actions, think that the impelling cause of the action determines its moral quality; but common men are not scientific. It is true that parents transmit to their children their passions, their weaknesses, their virtues, their moral and their intellectual characteristics, just as they transmit features, complexion and constitution; but parents are not scientific. It is true that the Hindoo is morally a Hindoo; that the Bushman is morally a Bushman; and that the enlightened European is morally on a very much higher plane than the Hindoo, who is on a much higher plane than the Bushman. But these are very unscientific facts, and therefore so much the worse for the facts. It is unscientific to hold that the European is broad minded and kind hearted, because of co-existences, or sequences in his surroundings, or to hold that the Bushman is a mean, degraded, cruel savage, because of his training, his ancestry or his surroundings. Moral characteristics do not depend on the laws of cause and effect, but on will, says the scientific Mr. Kouns. Calvin did not burn Servetus because his age and education had trained him to bigotry and intolerance, and the fact that nine-tenths of his contemporaries were not horror struck at the act, but regarded it as quite reasonable, is wholly unaccountable. The wills of those folks were fearfully perverted, but were entirely free. To inquire why they willed such bloody murders for religion's sake, is unscientific, "a pitiable and inexcusable error," "utterly unscientific."

Not only is Mr. Kouns wonderfully original in fundamental principles, but he is equally distinguished with a famous teacher of old, as one who "speaks with authority, and not as the Scribes and Pharisees." Columns of alleged facts disappear when Mr. Kouns announces that they are "utterly false in fact." It becomes "absolutely certain that the first necessary work of a soul when quickened by conjunction with a spirit, is to begin the work of erecting a natural body for itself" on the unsupported word of Mr. Kouns. By a statement it is settled that the original primitive faith of the ages when men used stone hatchets and dwelt in caves, "was a purer theism than any existing religion teaches." And this proposition being so scientifically established the conclusion is drawn that it must have been a "Divine Revelation." Originality crops out strongly in the nature of this primitive God of Mr. Kouns' construction. He was a dual God—a male and female God—a hermaphrodite God. And to keep up his originality to the end of the chapter the writer asserts "that the Revealed Religion was never designed for anything but the temporal salvation of mankind;" that it has not a word in it about "immortality," the life to come," or "a future state of rewards and punishments;" that it is "Faith plus Communism, the only true democracy." Verily we have a Prophet in our midst, and we will do well to hearken unto him. His message is such as never before was heard in this world, and it completely refutes the old law of Solomon, that there is nothing new under the sun. Here is news both to Agnostics, who do not know beyond experience, and to the innumerable sects who fill the churches of Buddha, Mohammed, and Christ with praise and prayer to their various Deity.

Yours Truly,

M. CAMPBELL.

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## SCIENTIFIC AND INDUSTRIAL NOTES.

### THE KANSAS ACADEMY OF SCIENCE.

The Kansas Academy of Science has just closed a most successful meeting, both in the number and character of the papers read and in the number of visiting members present.

The first meeting of the Academy held at Manhattan was the fifth annual meeting, in 1872, the one just closed being the second held in this place. The members present at both meetings were few, but four being found. Three of those prominent at the meeting in 1872, General Fraser, then President of the Academy, and Professors Mudge and Bardwell, have since died; while others have long ago left the State. In spite of the loss of members by death or removal, the Academy gains rapidly by accessions from the ranks of young men, college students and others, till now it stands in the most prosperous stage of its existence, as evinced by the interest taken in the meetings by members and visitors. It is impossible to do justice to the programme of over forty titles within the limits of one article; and we shall not attempt to mention even all those of importance. The following are taken at random, as indicating the general scope and interest of the entire list of papers presented:—

The discovery of a fossil bird track in the

Dakota sandstone, by Prof. Snow, considerably extends the geological limits of bird life. The specimen is unmistakably a bird track, the peculiarities of the foot being shown distinctly in the impression, the relations of the several parts of the track precluding any other origin.

In his studies on rainfall in Kansas, Professor Lovewell finds that, in considering the records by five-year periods, some of these periods which occurred during the earlier years of the record, had a larger rainfall than any other period of later date. He considers the conclusion to the effect that the rainfall has been permanently increased, which some have drawn from Professor Snow's paper of last year, as being without sufficient foundation. It should be remembered, however, that Professor Snow claimed only that the record already made shows an excess of rainfall during the last half of the period over that of the first half, amounting to several inches per annum.

Mr. Knaus' observations upon the Cedar Bark Beetle, Phlœosinus dentatus Say, have a practical interest to every planter of the red cedar or the aborvitæ in Kansas. The range of this insect is considerable; but so far as observed, the species is not found in Kansas, save as introduced in cedar posts from Arkansas or Michigan. Its attacks upon trees in Kansas are found to be made chiefly in the vicinity of lumber yards, where, on investigation, the species is found, as stated, in imported cedar posts. Mr. Knaus records the presence of a parasitic ichneumon fly, which will doubtless tend to render the propagation and spread of the species less possible in our State.

In his paper, Professor Sayre discussed the subject of Digestive Ferments, giving especial attention to pepsin and pancreatin, —the nature of these substances and the method of their preparation. As to the nature of these principles, the author seemed to indicate that the more light there was thrown upon the subject, the more complicated it seemed. The further investigation of it unquestionably will be not only of scientific interest, but of great importance to medicine and suffering humanity.

Messrs. Willard and Failyer presented the description of a new extraction apparatus, devised by themselves, and showed a simple instrument made after their plans. The device gets its great recommendation in its greater simplicity, and in the absence of corks, wires, and other unmanageable attachments, and in the consequent greater ease of handling and greater precision of results.

Professor Lovewell's paper on Methods of Illustrating Wave Motion, and the paper upon some Lissajou's figures in three dimensions, by Messrs. Nichols and Franklin, describe, directly or incidentally, class-room apparatus of simple and cheap construction for the illustration of some interesting questions in physics.

The first evening was occupied by the retiring President, Dr. Brown, who discussed in both the scientific and the practical aspects, the subject of Natural Gas, its occurrence, and the methods of utilizing it. The second evening of the session was occupied by Professor Nichols, whose subject was the Magic Lantern. After describing the origin of the magic lantern, and its development from a mere toy of the conjuror to an instrument of wide usefulness in science, the lecturer showed its applications in the illustration of science by means of photographic slides, and by various chemical, magnetic and optical experiments.

The third evening of the session was given to a social gathering at the College, where the visiting and local members, aided by memb rs of the College Faculty, discussed the practical side of the important topic, Science in the Kitchen, as presented by Mrs. Kedzie, the teacher of household economy, assisted by the young ladies of the fourth-year class.

The officers elected to serve for the ensuing year are: E. D. Nichols, President; J. D. Parker and N. S. Goss, Vice-Presidents; I. D. Graham, Treasurer; E. A. Popenoe, Secretary; F. W. Cragin, Librarian. In response to an invation by the Emporia members, that city was voted the place of next meeting, in November, 1886.—Prof. Popenoe, in Indust.

## MOLDS.

All the forms of plant life—the yeast-plant, the protococcus, the diatoms and desmids and the bacteria—consist of single simple cells, and so are called unicellular plants. Now all plants, no matter how large they are when they have attained their full size, are, in the beginning, unicellular. It is by the repeated division and sub-division of this original cell that the full-grown plant is built up. As the cells go on multiplying in this way, they undergo differentiation—that is to say, they become separated into groups, each of which has special characters adapting it for a particular function in the life of the plant. Thus, some cells go to form the bark, others the wood-tissue, etc.

It will be interesting to take one of the simpler many-celled plants and trace out the stops of its growth from the time it consists of a single cell, to the time when it has attained its full growth, and is made up of many cells. Let us take for this purpose one of the molds, Penicillium glaucum. The molds, with the appearance of which to the naked eye as white or greenish patches forming on dead organic matter in damp places everybody is familiar, belong to the larger group of plants called fungi. The species of mold we are now to consider, may readily be cultivated for examination, by making a paste of flour and water, and allowing it to stand exposed to the air for a few days. The first appearance of the mold is a slight whitish opacity at the surface of the liquid, and close examination would show little elevations at these places. These patches rapidly extend, and become more opaque, and in three or four days take on a bluish-green look at the center. The whole mass now seems to float on the liquid. After a while it acquires a more decided green color, the coloring appearing first at the center and radiating outward. If now one blows upon it, a cloud of green dust will be seen; this dust is made up of spores.

Under the microscope, one of these spores is seen to be a spherical body, one three-thousandth of an inch in diameter, and consisting of a bit of fluid protoplasm, invested by a more dense and tough sac. If one of the spores that has fallen into the liquid paste be watched, a change in its appearance will soon be seen to occur. The spore grows larger, its liquid contents become granular, and in three or four hours there is protrusion of the cell-sac. This protrusion soon becomes an elongated process, and gives off branches from its sides. Just before the places of branching, cross-partitions are formed, and so the plant has now come to consist not of a single cell, but of several cells united. Meanwhile, other processes have been growing out from the spore and giving off branches, and after a time they become intertwined with one another and with those from other spores, and thus a delicate white film forms on the surface of the paste. This film is called a mycilium, and the separate branches of which it is made, hyphæ.

Examining a single one of these hyphæ, it will be seen that it is separated by cross-partitions into chambers. Each of these chambers constitutes a perfect cell; each consists of a liquid inner part and a surrounding tough, transparent envelope. Usually the inner part has four or five clear spots in it, called vacuoles.

For sometime all the hyphæ lie parallel to the surface, but after a while a few may be seen to hang down in the liquid. These are called submerged hyphæ. Soon after, other hyphæ grow up into the air, and it is then that the mold begins to take on its green color. These erect hyphæ are at first like the others, but by-and-by become modified. They give off branches both at their sides and ends. The latter, or terminal branches, next become pointed, and these points swell out into balls; the necks of the balls then enlongate, swell, and so form other balls, and this process is continued until a row of six or eight of them is produced. Now, each of these balls is a spore; as soon as it has become ripened, it falls from the hyphæ to the surface of the liquid, and gives rise to a new plant. Of course it often happens that a spore is carried off by

a current of air, and the matter of its living or dying depend upon the kind of material upon which it chances to fall. If it falls upon some organic matter from which it can get food for its growth, it becomes a new plant; if not, it dies. That such spores float about in the air in great numbers is shown by the commonness of molds.

Another common mold, Mucor mucedo, has a life history different in some respects from the above, and sufficiently remarkable to deserve notice. This mold is quite large and the hyphæ can readily be seen with the naked eye; it commonly grows upon the fresh excrement of horses. In Mucor the ends of the erect hyphæ enlarge into single spherical box-like bodies within which the spores are contained. These boxes, or sporangia, when the spores are getting ripe, become covered with a thin coating of oxalate of lime, and at the same time the hyphæ lengthen out a great deal, and bend toward the light. Thus, after a while the sporangia strike against the surface from which the mold is growing, and its brittle covering bursts and allows the spores to escape.

Sometimes Mucor reproduces itself in a way still more remarkable. A couple of hyphæ come together at their tips swelling out as they approach each other. When they have come in contact, partitions form, cutting off the ends of each. The two ends then unite, forming a spherical body, and in it spores soon make their appearance. The body after a time becomes detached from the hyphæ and falls. After lying for six or seven weeks, the covering bursts through and the spores are diffused.

These two methods of generation occur alternately, and afford an example of the process called alternation of generations, and known of both animals and plants.—Cor. Country Gentleman.

## VISIT TO MINES OF UNKNOWN PERIOD IN THE SERRO DE LAS CANAS.

Last Saturday, at 6 o'clock in the morning in company of Don Jesus Maria Chavez, the mining representative of this paper, behind a span of fast horses, took his departure for the old workings which are situated on the east side of the Rio Grande. At about 10 o'clock the base of the 500-foot and almost inaccessible cliff, upon the summit of which the old mines are situated, was reached. To ascend was by no means an easy task. However, after a half-hour's struggle the old shafts were in view. They were discovered in 1880 by Mr. Chaves, who while perambulating over this elevation, found his cane entering the soil in an unaccountable manner as he was leaning upon it. Upon examination he discovered that it had entered between two large rocks. Upon closer investigation he found that these large slabs covered the entrance to an opening beneath a dump in the vicinity, leading him to believe that an old abandoned mine lay beneath him. With some assistance he rolled away the obstacles, and upon exploring the shaft he found it to be about 70 feet deep, with a drift running to the east about 100 feet. As the roof has fallen in, numerous floors and many of the large chambers are filled with debris. It was found impossible to go further; but no doubt exists that these underground workings will be found to be of great magnitude when thoroughly explored. Just the reason why these shafts and drifts were excavated is hard to say, as no mineral is visible to the naked eye. Average rock of the crevice, however, is now being treated, and perhaps gold can be detected. Not the slightest vestige of European handicraft exists. A few fragments of indented and corrugated pottery upon the dump would indicate, however, that these properties were worked at a period anterior to the Spanish occupation of this territory, and are probably of that class of mines mentioned by Father Kino, the brave old priest and missionary, who in 1658 visited this land to evangelize the natives. In speaking of the miners of that period, he says: "They understand mining to some extent—not mere surface labor, but extracting the ore from the veins which they opened in solid rock, unearthing vast quantities of gold and silver, which they seemed

to value only as it contributed to their comfort when made into articles of use or ornament." Not far from one of the shafts, a beer bottle containing a location by Daniel Lemons and Robert Howard was found, dated February 18, 1882. The formation in the vicinity consists of strata of lime, underneath which lies thin but numerous strata of red and grey sandstone. At the base of the eminence large deposits of sulphate of lime were found. The dump of the old workings afforded sulphate of lime, calcite and limestone, but no quartz. The entire absence of primitive metamorphic rock and all signs of copper, iron or lead, were manifest. The determination of the component parts of the specimens selected will be awaited with no small interest.—Socorro Bullion.

## ANTHROPOLOGY.

The earliest travelers among the Indians mention mounds with buildings on the top of them covered with earth. In the mounds which I have examined, wherever burnt clay has been found more or less ashes occur underneath, and the impress of grass, sticks, cane or poles plainly reveals itself in the burnt clay. These vegetable substances were needed to support the earthen roof of the dwelling.

The dwellings of some modern Indians are built of poles, sticks and grass, covered thickly with mud. Upon the death of any of the inmates the house is burned down, and the framework consuming partly bakes the clay and leaves its impress therein. The Pimos and Maricopas of the Gila river, with all of the Indians of the Colorado river, build winter and summer dwellings. The former are hemispherical and mud-covered, the latter is an open mud-covered shed. When these are burned down at death, the clay is baked and appears like that dug from many mounds.

In many of the modern houses the earth is dug out in the center for a foot or more; this points to the reason for the pits found in the middle of mounds. Charred posts are found in mounds, the same phenomenon presents itself whenever a summer shed is consumed.

In examining the celebrated ruins of adobe and stone houses in Arizona, it is found that they were destroyed by fire, burnt clay with impressions of sticks and poles being found in them.

The examination of some mounds demonstrates the existence of buildings without clay covering. Now I have lately visited several Indian tribes who live in the hot season under sheds covered with thatch, with merely earth enough above to keep the twigs from blowing away. Now the burning down of such a shelter would leave only ashes and charcoal.

Again, both houses are on the outside the receptacle of everything which the Indians wish to keep out of harm's way, baskets, pottery, wattled granaries for corn, mezquit, etc. Now in some mounds I have found the pottery and other relics so curiously located as to leave little doubt in my mind of the burning of such a structure as I have just described.

The modern hut builder does not cover his consumed dwelling with a mound because the new arts taught by the white man and his new environment have taken away all necessity. Furthermore, the argument that the superior arts of the former Indians were associated with better houses for the artists is false. The finest works of modern art are produced in places no more elegant than the Pimo's summer shed.—Edward Palmer, in Am. Nat.

## THE DAVENPORT ELEPHANT PIPES.

Mr. Charles E. Putnam, of Davenport, Iowa, has published a pamphlet of thirty-eight pages as a vindication of the authenticity of the elephant pipes and inscribed tablets in the museum of the Davenport Academy of Natural Sciences, from the accusations of the Bureau of Ethnology of the Smithsonian Institution. Those who have known the history of Davenport Academy, its struggles and triumphs for the love of pure science, and the extreme caution of its leading members, regretted that anything

should appear in a Goverment publication reflecting upon their veracity or honesty. Tablets are common enough, being made of slate and other material and worn to-day by the present Indians of British Columbia and Alaska. So long as they do not contain outlandish and unclassifiable inscriptions there is nothing mysterious about them. On the contrary, the elephant pipes are mysterious. When I try to put the cast which we possess at the museum with something else, there is nothing to put with it. Professor Henry once said to one of his assistants who discovered an unclassifiable specimen: "That seems to stand out so unsociably that we must call it an 'outstanding phenomenon,' and wait patiently until something else turns up to go with it." The last word that should fall from the lips of a brother naturalist is "fraud."

On the other hand, barring this indiscretion, Henshaw is just what Major Powell says about him. He is a very careful and skillful naturalist. We should hail with delight the accession of all such men to the ranks of archæology because they bring light from every side to bear upon our mysteries. It should not make a particle of difference to any of us whether a pipe is the figure of a crow or of a toucan, so long as we know just what it represents. We may rest assured that for a long time every mystery solved will be accompanied by two quite as inexplicable.

But, really, too much account is being made of the matter. Squier and Davis are not overthrown. Their manatee, toucan and paraquet may be shot down by the ornithologist, but these practical gentlemen did not care a fig about such creatures. They made the greatest archæological survey and collections ever attempted in America, and their volume will indeed be a "monument" to their memory and to the glory of its authors for all time.

The Davenport Academy is not annihilated. Even if our theory should turn out true and the elephant pipe should prove a tapir pipe, and we should learn that tapirs once lived in the Mississippi valley, this grand association would survive.—O. T. Mason in Am. Nat.

## THE SILVER QUESTION.

The following, from the Engineering and Mining Journal, states briefly the probable effect of the recent action of the Monetary Convention between the Latin Powers on the value of silver:

"France, Greece, Italy, and Switzerland have renewed the monetary convention for five years; silver coins redeemable in gold, no additional silver coinage permitted; convention open to Belgium."

This is the important announcement that comes to us by cable, and which is supplemented by a later dispatch, which says:

"The Monetary Convention between the Latin powers, providing for the suspension of the coinage of silver, permits each power to resume, provided the silver circulating in the other states is redeemed in gold by the resuming state."

In other words, the Latin Union has discarded bi-metalism and has agreed to redeem its present silver coinage in gold. Silver coinage will also be suspended, at least until the country has drawn into circulation the silver already coined. No more silver is to be coined for the present, and that already coined becomes, under this convention, simply a subsidiary coinage redeemable in gold. Belgium, which has been coining for many other countries, declines to redeem this coinage in gold, and consequently does not enter the Union. This action, in all probability, will lead to the adoption in this country of a policy similar to that of the Latin Union, for the redemption of silver in gold. It would be the purest folly for this country to continue coining silver beyond our needs, or of endeavoring alone to establish an arbitrary ratio between silver and gold.

This is the heaviest blow that the advocates of bi-metalism have received; but, no doubt, the step is necessary even in the interest of bi-metalism; for there is no prospect of England and Germany joining in the adoption of a standard ratio so long as

some of the countries continue to buy and coin their silver, leaving them the gold. England, through India, has perhaps a greater interest than any other country in maintaining the value of silver, and it may be that the depreciation in silver that will probably follow this action of the Latin Union may lead to some united action looking to the establishment of a standard ratio between gold and silver. That such action will be taken is, certainly, not immediately probable; and for some time to come, the value of silver will be more than ever dependent on the demand for commercial uses outside of coinage requirements.

## THE PHILOSOPHY OF VACCINATION.

Professor Tyndall explains the philosophy of vaccination as follows: "When a tree or a bundle of wheat or barley straw is burned, a certain amount of mineral matter remains in the ashes,—extremely small in comparison with the bulk of the tree or of the straw, but absolutely essential to its growth. In a soil lacking, or exhausted of, the necessary constituents, the tree cannot live, the crop cannot grow. Now, contagia are living things, which demand certain elements of life, just as inexorably as trees or wheat or barley; and it is not difficult to see that a crop of a given parasite may so far use up a constituent existing in small quantities in the body, but essential in the growth of the parasite, as to render the body unfit for the production of a second crop. The soil is exhausted; and, until the lost constituent is restored, the body is protected from any further attack from the same disorder. Such an explanation of non-recurrent diseases naturally presents itself to a thorough believer in the germ theory; and such was the solution which, in reply to a question, I ventured to offer nearly fifteen years ago to an eminent physician. To exhaust a soil, however, a parasite less vigorous and destructive than the really virulent one may suffice; and if, after having, by means of a feebler organism, exhausted the soil without fatal result, the most highly virulent parasite be introduced into the system, it will prove powerless. This, in the language of the germ theory, is the whole secret of vaccination."

## THE PYROPHORE.

At a recent meeting of the Academy of Sciences, at Paris, a plate half filled with water, in which were half a dozen insects about an inch in length, which shone like diamonds, although the room was filled with sunshine, was passed around among the members. These insects had been brought from Mexico, where they are to be found in the forests. Their scientific name is the pyrophore; and, as none had ever been seen before in Europe, they created quite a sensation. The light resembles that of a glow worm or a fire-fly, although as much more brilliant and intense as electric lamp surpasses a wax taper in its power of illumination. When the light begins to fade, it can be made as brilliant as before by shaking the insect, or dipping it in water. It is said the Indians of Mexico use them for a light at night, as a few will suffice to illuminate an entire room. When they are walking at night, they put one on each foot, so that they can be sure of their way, and also that they do not step upon any venomous snake or reptile with which the tropical forests abound. The Mexican ladies buy them from the Indians, and enclose them in a transparent bag, which they wear in their hair or at the neck. The effect is very beautiful, especially when several are worn; and, as the Indians sell them for a few cents a dozen, they are within the reach of every fair one. They are fed on sugar-cane, and, if well taken care of, will live a long time. One placed upon a page will enable it to be read with ease in the darkest night.

## MONSTER SEA-TURTLE FOUND IN KANSAS.

The discoverer of a gigantic extinct sea-turtle found near Fort Wallace, in Western Kansas, first observed the large bony shields projecting from a bluff near Butte Creek.

They were carefully taken out and brought to Philadelphia, where the restoration was made. The fore-flippers alone were nearly five feet long, while its expanse from the tip of one extended flipper to another was about seventeen feet. The question may arise, how did this sea-turtle become buried in a bluff in the State of Kansas? A natural supposition would be that Kansas is the bed of a former ocean, and so it is. Ages ago, in what is called by geologists the Cretaceous Period, that part of the world was the bed of a great sea, in which the great turtle swam, together with other monsters of curious shape and appearance. Gradually the crust of the earth was raised, the water fell back, or became inclosed, and left the inhabitants of the Cretaceous Sea high and dry, to be covered by the earth and preserved for us to study ages afterward.

The shores of this ancient ocean are easily found and followed by geologists. Its extent has been traced on our Western plains by the bleaching and disintegrating remains that have been found, upon and beneath the surface.—Charles Frederick Holder, in St. Nicholas.

## DIFFUSION PROCESS OF EXTRACTING BEET SUGAR.

At a late meeting of the Scientific Club at the Kansas Agricultural College Prof. Cowgill presented a paper on sugar-production, in which he sketched, briefly, the history of surgar-production and its various methods of manufacture. The most common sources of sugar are the tropical cane of the semi-tropical regions of North America, the sugar beet of France and adjacent countries, and the sorghum cane, which is an Asiatic plant, and was introduced from France into this country about thirty-two years ago, at which time it was hailed by abolitionists as a relief from the consumption of sugar produced by the slave labor. This produced a disappointment. It has been proved in France that the quantity of sugar found in the beet depends greatly upon the manner of cultivation; this is also true of sorghum. In the process of manufacture the following distinct processes are noted: extraction of the juices, cleansing of impurities, condensation of evaporation, crystallization, separation of crystals from syrup and refining. In the extraction of the juice by means of crushers, it is found that only about forty-five per cent. of the eighty-eight to ninety per cent. of juice in the weight of the cane is extracted. Or, in other words, only about one half of the juice is extracted. Besides this, the crushers break down the cell-walls in the cane and carry their substance into the juice, from which it cannot be removed. By the "diffusion" process, these objections are sought to be overcome by the cutting of the cane diagonally into chips of about one sixteenth to one eighth of an inch in thickness, and placing them in a tank which is divided into two compartments by a membrane, through which an osmose action can take place. The chips in one compartment are covered with water, and water placed on the other side of the membrane; and when, by diffusion, the liquids in both compartments attain the same consistency, a part of the juice has been extracted from the chips and held in solution on the water side of the membrane. This is drawn off and applied to fresh chips, and the process repeated until each measure of water has passed through six measures of chips, thus insuring about double the amount of juice extracted, and at a less cost than by means of the crusher.

## A SUGGESTION THAT MAY PROVE OF VALUE.

Some one, reasoning on the hypothesis that organic life is only able to resist its destruction by the ordinary law of nature through the constant change of bulk and form of its body, has advanced a suggestion which may prove fruitful in these days of vivisection. When it is desirable to prolong the life of a plant, some parts are cut off from it or another body fastened to it, or vice versa; and of this sort of treatment for the promotion of longevity in the veg-

etable kingdom a most notable and successful instance is incidently cited—the rose bush, now nearly a thousand years old, which is trained on the wall of a church in Hildesheim. Further—accepting as true the proposition that in the animal kingdom those creatures which by some means are able to change the bulk or form of their bodies live longer than those that cannot do so—our author ventures the belief that we may lengthen human life by removing morbid matter at certain intervals, or by altering the form of the body!

## A HUGE BRIDGE.

The project of a tunnel under the Straits of Messina, to connect Sicily with Italy, is an enterprise which has long received the attention of engineers and been recommended by scientific experts. Recently, however, a Piedmontese company has come forward with a counter project for a bridge, an enterprise which, it is remarked, will, if ever carried out, constitute as remarkable a work of the kind as there is in the world. According to the published statement, the width of the strait at its narrowest point is about two miles, but, owing to the great depth of the water—more than 500 feet—on this line, the projectors propose to locate the bridge where it would have a length of about two miles and a half. The plan of this gigantic structure involves four piers, connected by spans of five-eighths of a mile in length, the two shore arches having half the span of the three central ones.—Electrical Review.

## THE KINETIC THEORY OF GASES.

The modern kinetic theory of gases, says Prof. Tait, in offering a suggestion as to the source of atmospheric electricity, shows that the particles of water vapor are so small that there are somewhere about three hundred millions of millions (a truly vast number) of them in a single cubic inch of saturated steam at ordinary atmospheric pressure. This corresponds to 1-1600 or so of a cubic inch of water, i. e., to about an average raindrop. But if each of the vapor particles had been by any cause electrified to one and the same potential, and all could be made to unite, the potential of the raindrop formed from them would be fifty million times greater. Thus it appears that if there be any cause which would give each particle of vapor an electric potential, even if that potential were smaller than any that can be indicated by most delicate electrometers, the aggregation of these particles into raindrops would easily explain the most formidable thunder cloud.

## GETTING THE TASTE OF MUTTON.

A queer story comes from New Zealand. The owls in that island used to be harmless as doves; indeed, they were once "mousing owls," and, therefore, useful. But one night a settler left a sheepskin nailed to his roof, and an owl came along and tasted of the fat mutton left thereon. That owl became a sheep killer, alighting on a sheep's back three nights later. Still more strange all the other owls began to like mutton, and now the New Zealand bird of that species slays thousands upon thousands of sheep their appetites growing by what they feed on, and their numbers increasing in proportion to their prosperity. They alight on the backs of the sheep and tear the poor beasts with their beak, going at once down through the carcass to the kidney fat, which to the owl's tongue is the daintiest of morsels.—N. Y. Dispatch.

## COINS AS DISEASE DISSEMINATORS.

That the small coins of all nations may be a most potent factor in disseminating disease is a discovery due to the researches of Dr. Reinch. Taking the specimens of coin which had been long in circulation he scraped off the thin organic incrustations, which he then divided into small pieces and dissolved them in distilled water. Microscopic inspection of the solution disclosed abundance of bacteria and vegetable fungi. After this there is ample reason for caution in handling money made of metal; of the

danger of filthy paper currency the public has long been aware. Application to coins of a boiling weak solution of caustic potash will, however, free them of their organic impurities. Withdrawal from the circulation of old, dirty dollar bills and replacing them by new ones is perhaps the best way to prevent paper money acting incidently a not considerable role in the mechanism of epidemics, as well as of mercantile exchange directly.

## RED AND PURPLE RIBBONS SUPPRESSED.

In consequence of a letter written by Examiner Antisell, of the Patent Office, the secretary of the treasury has ordered the use of red and purple ribbons in the government type writers to be discontinued in preparing papers intended for permanent record.

In reply to queries of the acting secretary of the United States treasury, the examiner says: There are ten different ribbons used, five being copying ribbons, and five record ribbons. The word "permanent" which appears in the inquiries presented, should be understood as referring to power of resisting obliteration by the action of light, of washing, of treatment with acids and alkalies, as ordinarily practiced by those operating to remove the ink. The color of the ink may be changed by such treatment (as from blue to black, black to green, and other similar changes of shades), but, whether change of color be produced or not, the ink is not effaced; it is legible, the letters are not obliterated, and therefore such ink may be said to be permanent. This is eminently true of black record ribbons. Another ink is furnished, called the black indelible copying ink, which has also the above-mentioned properties of permanence.

The ribbons of other color than the foregoing are . . . found to be fugitive—red and purple particularly so. They, for this reason, should not be used for recording permanent records. These inks cannot be styled permanent. It may be stated here that the same ink has different results as it is applied on paper by the ordinary writing pen and as applied to similar paper by the type writer; in the latter instance, from its soaking more deeply by the impact of the machine, and being forced below the surface of the paper, it is more difficult to be removed or reached by chemical agents applied; therefore, an advantage accrues in the use of the type writer over the pen. "Are copies made on the type writer by the use of carbon paper permanent in their nature? may be answered as follows: If these carbon paper copies do not require to be frequently referred to, they may be said to be permanent in their nature. Owing to light pressure upon the paper, the ink is not deeply embedded, and may be easily removed by friction. This appears to be an objection to the use of carbon paper. In all cases where permanence is desired, the paper should be as thin as may be consistent with its cohesive strength, and bearing as little thickening material or size as possible.

## GOLD UNDER PHILADELPHIA.

It has long been well understood that gold is the most universally distributed of metals, being found in all parts of the world, but most readers will probably be surprised at a statement recently made by Prof. A. E. Foote, of this city, to the effect that there is more gold in the clay under the city of Philadelphia than would equal the entire valuation of the city. In 1812, men made sixty cents a day in washing the sands near Chester, on the Delaware River, where William Penn first landed, and quite recently several dollars' worth of gold in grains were taken from a well one hundred and fifty feet deep within twenty miles of Philadelphia.—Wood and Steel.

## HOW OLD SOL USED TO SHINE.

In 1303 and 1304 the Rhine, Loire and Seine ran dry. The heat in several French provinces during the summer of 1705 was equal to that of a glass furnace. Meat could be cooked by merely exposing it to the sun.

Not a soul dare venture out between noon and 4 p. m.

In 1718 many shops had to close; the theaters never opened their doors for three months. Not a drop of water fell during six months.

In 1773 the thermometer rose to 118 degrees.

In 1778 the heat at Bologna was so great that a great number of people were stifled. There was not sufficient air for the breath, and people had to take refuge under the ground.

In July, 1793, the heat again became intolerable. Vegetables were burned up and fruit dried upon the trees. The furniture and wood-work in dwelling houses cracked and split up; meat went bad in an hour.

## ANCIENT RIVERS.

The ancient gravel channels of California were formed, it is believed, during the Pliocene period, and extend from Mariposa county in the south to Siskiyou county in the north, having an aggregate length of about 320 miles. The auriferous area has been estimated to be 200 square miles. These channels are from 200 to 400 feet wide on the bottom, and sometimes as much as 2,000 feet wide on the surface. They are filled with gravel from depths of 20 to 400 feet. The deposit at the bottom consists of boulders, cobbles, gravel and sand firmly cemented together. This bottom deposit is commonly known as the "blue lead" from its color, and varies in thickness from 20 to 120 feet. Above the "blue gravel" is found the "top gravel," consisting of sand and occasional boulders, with sometimes layers of pipe clay. Near the surface is found red soil, varying from a few feet wide to 20 feet in thickness. Gold is distributed very uniformly through the entire mass of gravel, being most abundant near the bed-rock. These ancient channels are sinuous in their course and have many branches and tributaries. Their grades vary from 20 to 300 feet per mile—sometimes confined within narrow banks and again assuming lacustrine proportions. They undoubtedly carried more water than do the present rivers of California. The fact of the material being coarser and larger at the bottom is due to the great velocity of the rivers where confined to narrow channels. As the filling increased the transporting power of the streams became less from the diminished depth of the water, and hence the latter deposit was of firm material.

The principal gravel mines of California are situated in the counties of Yuba, Sierra, Placer and Nevada, in the region drained by the Feather, Yuba and Bear rivers. It has been estimated from careful canvass of this industry, that there are on the drainage system of these rivers 300 mines or tracts of mining lands which have been worked within the past three years, though not, perhaps, simultaneously, by the method distinctively known as "hydraulicking," besides numerous "drifts," "rivers" and placer mines, which are dependent upon water washing. The magnitude of these mines, whether hydraulic or drift, depends on the width and length of the channel.—W. A. Skidmore, in Mining Review.

## THE TORONTO ELECTRIC RAILWAY.

The electric railway now being operated by the Toronto industrial Exposition is a perfect success. It is something entirely new, and differs from the one run here last year. It is not a toy or an experiment, but a practical railway, carrying the visitors to and from the fair grounds, making connections with the horse cars. When it is considered that the maximum of power used was only thirty-horse power, and that the number of passengers carried on Saturday last was nearly six thousand, and yesterday ten thousand, it is truly wonderful. The motor, which is one of the latest improvements of Mr. Van Depoele, is placed upon one of the cars and is connected to the axles. It is controlled, and made to run fast or slow as desired. The electric current is conveyed to the motor through an overhead one-fourth inch copper wire; it passes into a small copper wheel which is on top of the car, and presses against the under

side of the wire, thence through the motor to the car wheels, then through the track back to the generator.

The length of track is nearly one mile, with curves of 250 feet radius and grades three-fourths of an inch to the foot. The run over the track takes 2½ minutes. The company has only three cars besides the motor cars, hence it was necessary to do lively work on Saturday last and yesterday. The cars were run for fifteen hours continuously. The average time for round trips, including loading and unloading passengers, was ten and one-half minutes. It is doubtful if this has ever been beaten.

This motor and electric railway system is the invention of Charles J. Van Depoele, electrician of the Van Depoele Electric Manufacturing Company, of Chicago. Van Depoele claims that he can, with his system, run forty or more trains at a time on the elevated railways of New York, or run trains fifty or more miles with great saving over steam locomotives.

## A PEDAGOGUE IN KANSAS.

The first visit to the wonderful state of Kansas is apt to leave the mind in a condition as disheveled as a maiden with a mighty "head of hair" in one of the brisk, breezy days of that many-sided state. Although one of the youngest states in the world, Kansas rivals old England in the wondrous beauty of her fields and the refined and subdued lines of her exquisite "rolling prairies." Within a space of ten days, in June, we encountered weather enough to suit the most fastidious and versatile new-comer. Scores of towns, before only names on a railroad map, were found busy centers of industry, each with a mighty hope for the future. There are too many good things in Kansas for one number of "Drift." But the glory of all is the common school which new Kansas wears on her bosom, like a splendid maiden arrayed in her beautiful garments, wearing a boquet of "flowers of all hue, and without thorn the rose." The public schools of its cities are in a state of hopeful rivalry with each other. The county superintendents, whom we met in council, are a body of earnest, often able men, with twelve lady superintendents for their "aid and comfort." State Superintendent of Instruction Lawhead, is a good man in a large place. The State Normal School at Emporia, is crowded with pupils and working towards the best results. The agricultural college at Manhattan, under the presidency of one of the Fairchild brothers, is unsurpassed for beauty of situation and skillful adaptation to the public need. Kansas desires the presence of the National Convention, next year, at Topeka, and very strong reasons must be given for rejecting her invitation.—Journal of Education.

## COMPRESSED AIR STREET CARS.

The line of the London Street Tramways Company from Holloway to King's Cross, is about to be worked exclusively by compressed air machinery instead of horses, as hitherto.

Underneath the car body is a series of cylindrical reservoirs, which may be charged with enough compressed air to propel it a distance of ten or twelve miles. The car is four wheeled, one pair of these wheels alone being used for driving; and, to save the expense and inconvenience of turn-tables, the car may be driven from both ends. To the driving wheels are attached a pair of high and low pressure ordinary working cylinders, each of 8 inches stroke. Means are provided by which the high pressure air can be used in the low pressure cylinder, if necessary, for starting. The air in passing from the reservoirs to the cylinders bubbles through boiling water and steam of sixty pounds pressure on the square inch, contained in a vessel called the "hot pot," of which there is one at each end. This vessel is charged at the pumping station during the time occupied in charging the car with compressed air. The advantages claimed in thus using the air, are that the heat which the air takes up in passing through the hot water not only causes the air to expand, but prevents the formation of snow in the cylinders at the exhaust. The mois-

ture also picked up by the air in its passage through the hot water acts as a lubricant for the side valves and pistons.—Railway and Tramway Express.

## SCIENCE AND THE GOVERNMENT.

Frank Wigglesworth Clarke notes the growing dependence upon scientific methods as a noteworthy feature of modern civilization, and finds in our national administration an amazing development in certain lines of scientific industry. Every executive department either has scientific experts connected with it, or employs such experts at times to conduct its investigations. There is a considerable demand for science in the defensive branches of the public service, such as the army and navy. The weather service uses the electric light to great advantage. The Department of Agriculture applies scientific research to the assistance of great industries. The Mint and Assay Offices has much to do with chemistry. The geological surveys develop more fully the principles of geologic science, and from an economic point of view investigate our mineral resources. The Patent Office reveals the fact that the Government has become the arbiter in doubtful questions of scientific priority. Scientific work is also frequently carried on at Government expense, which aims at the discovery of truth for its own sake, like the expeditions to observe the transit of Venus and the solar eclipse, as well as service rendered by the Beareau of Ethnology.

## A LITTER OF BABIES.

A correspondent of the Cincinnati Enquirer relates the following:

"A remarkable story comes from Henry county, just west of this city, (Toledo) which, if it were not thoroughly substantiated, would be almost incredible. It is to the effect that several days ago the wife of Wilhelm Freund, a German farmer, living about half a mile from Holgate, gave birth to five children, all boys, and that all the infants are well formed and alive. When the Enquirer correspondent investigated this stupendous increase in the census he found that the event is but one of a series that have happened in this interesting family. Mrs. Freund is 36 years of age, and during her nineteen years of married life has given birth to twenty-one children, eighteen of whom are now alive. The other three lived to various ages over a year. Dr. Townsend, of Holgate, has been in attendance at most of these events, and Dr. Harrison, of Napoleon, is also conversant with the facts and has assisted on some occasions. The mother is described as a comely German woman, raw-boned and spare, and the father short and solid, but not portly. This happy couple live on a small farm, which the husband tills with the assistance of his numerous progeny. Some of the children, it is said, were born in the hay-field where the mother was at work."

## INSECTS AS FOOD.

Locusts, so much dreaded by the farmers of all the civilized countries, are welcome in Arabia, and China, whose inhabitants look upon fried grasshoppers as a most favored dish. Livingston, the famous traveler, saw some tribes in Africa, who preferred buns of meal made from dried insects like our mosquito. Dr. Sneider, of Denmark, describes two other insects used as food. The mountain rivers and brooks of Chili abound in minute water beetles (Elmis Condimentarius) which are fished out by the natives in large quantities. After being dried, these beetles are used as a condiment known under the name of shishee. Shishee sauce is much valued in Chili and Peru. In the salt lakes of Nevada there are found millions upon millions of the larvæ of a fly known as Ephydra Californica. In July, when the larvæ are fully developed, the Indians collect them on the shores, dry them in the sun, and then squeeze them with their fingers. Thus they get a kind of grain which looks like rice of yellowish hue, which is ground into meal. From this meal the redskins prepare an excellent broth. In the lakes of Egypt and

Sahara, also, there are larvæ which are used by the natives as food.

## NEW APPLICATION OF IRON.

According to the San Francisco Chronicle, an inventor in Stockton, California, has discovered a new process of preparing iron, which is said to make a metal tougher and more elastic than steel. The material is to be known as cast wrought iron. It is a composition of which 70 per cent is cast iron, most of the carbon being taken out. Its manufacture costs from six cents to seven cents a pound, and the iron can be made in any ordinary iron foundry. It is said to be the strongest ever made, 100 pounds of it giving three times the strength of 150 pounds of cast steel. It is claimed that besides being tougher, stronger and more elastic than cast steel, the new metal can be easily forged without the slightest danger of chipping off. Under the lathe the metal gives a shaving similar to that of wrought iron and presents a smooth, close-grained surface. The peculiar qualities of the new substance, it is asserted, make it superior for machinery, as it can be made lighter and yet possess the required strength.

## TORNADO PREDICTIONS.

Mr. William A. Eddy, the tornado expert of the Signal Service Bureau, calls attention to the fact that the study of the phenomena of tornadoes has advanced so far that predictions of the appearance of these terrible destructive agencies can be made with a considerable degree of accuracy. Of thirty-eight predictions that tornadoes would occur in April and June of last year, eighteen were verified; of nineteen predictions in June and July of this year, fifteen were generally verified, and where regular tornadoes failed to arrive, violent wind and hail storms partially fulfilled the prophecy. Mr. Eddy thinks that a system of tornado signals should be established at every telegraph station in the tornado states. If the Government will do this much, at least some of the terrible loss of life and property due to tornadoes, can be averted. The facts presented by Mr. Eddy fully warrant the small appropriation by Congress which will be necessary to establish such a system of signals.

## A NEW GOLD-LIKE ALLOY.

The Chemical News, of London, calls attention to the fact that a new alloy, resembling gold in appearance, weight, and in withstanding the jeweler's test of strong acids, is extensively manufactured in England, chiefly, Mr. Lowe naively states, for the purpose of defrauding pawnbrokers, to whom articles of jewelry made of it are frequently offered in pledge. Mr. Lowe examined a bracelet that had been sold as gold to a gentleman in Liverpool. After scraping off the gilding, the article had the color of nine-carat gold. It was found on analysis to have the following composition:

| | |
|---|---|
| Silver | 2.48 |
| Platinum | 32.02 |
| Copper (by difference) | 65.50 |
| Total | 100.00 |

He adds that strong boiling in nitric acid, even when the article was left in it for some time, had apparently no effect upon the alloy. The alloy is called "mystery gold."

## WEIGHT OF COIN.

The standard gold dollar of the United States contains gold of nine-tenths fineness 25.8 grains, and the standard silver dollar contains silver of nine-tenths finenesss 412.5 grains. One million standard gold dollars, consequently, weigh 25,800,000 grains, or 53,750 ounces troy, or 4,479.16 pounds troy of 5,760 grains each, or 3,685.71 pounds avoirdupois of 7,000 grains each, or 1,863-1,000 "short" tons of 2,000 avoirdupois each, or 1,645-1,000 "long" tons of 2,200 pounds avoirdupois each. One million standard silver dollars weigh 412,500,000 grains, or 859,375 ounces troy, or 71,614.58 pounds troy, or 58,628.57 pounds avoirdupois, or 29,464-1,000 "short" tons of 2,000 pounds avoirdupois each, or 26,307-1,000 "long" tons of 2,240 pounds avoirdupois each. In round numbers the weight

of $1,000,000 in standard gold coin is 1½ tons; standard silver coin 25 tons; minor coin, 5c. nickel, 100 tons.

### SPONTANEOUS COMBUSTION FROM COAL-DUST.

M. Fayol concludes that the absorption of atmospheric oxygen by coal-dust usually produces the rise in temperature to which spontaneous combustion is due. He finds that lignite is ignited at the low temperature of 800 degrees, anthracite at 575 degrees, and other varieties of coal, in powdered form, at intermediate temperatures.

### TRANSPORTING NATURAL GAS.

Some one is proposing to liquefy natural gas and transport it as a liquid or solid. As natural gas is composed chiefly (95 per cent) of marsh-gas, which can be liquefied only at a very heavy pressure, the probability of explosions would make its carriage and storage in this form rather undesirable. The transportation of natural gas or of water-gas through large mains can be economically effected for any desirable distance without having recourse to so expensive and dangerous a plan as that referred to.

## MISCELLANY.

### A CYLINDRICAL JAIL.

In describing a new and particular jail just completed the Omaha Bee says: "The new jail just completed cost $30,000. Its peculiar feature is that the cells are arranged in the form of a great iron cylinder, which revolves about so that only one cell is at the opening at any one time. This cylinder is three stories high, there being ten cells on each floor. Its weight is 45 tons, and this ponderous weight is hung from above instead of turning on a track below. The strangest part of the arrangement is, that the great cylinder can be turned by a simple crank with little force, a man with his left hand moving it readily. When all is complete it is the intention to have a little water motor in the basement, and then by simply moving a lever the cylinder will be set to rotating. It is suggested that, when there are prisioners who it is feared may be trying to cut out, the cylinder can, by a motor, be easily kept moving slowly all night, so that the prisoners do not remain long enough in one place to do any mischief, or even to crawl out if they had made a partial break. It seems that prisoners have little chance for escape from this new jail. A cage of iron bars completely surrounds the cylinder in which the cells are. The entrance on each floor is guarded by two doors. The officer standing outside does not have to unlock even the the first door, but can swing the cylinder around until the cell appears in which is the desired prisoner, and then by a simple movement the inner door is opened and the prisoner can step out of his cell. Then the officer can open the other door and let the man out, but the other prisoners are way beyond any possible reach of the officer, and it is impossible for them to make any break on him while he is taking a man out or putting another one in. He can handle any number of men in the same way, and they cannot get withim reach of him until he chooses to let them.

### IMAGINATION AND DYING.

In reference to the influence of the imagination on the body, a doctor tells the following story in the Chicago Times: "A big hulking fellow about ten miles from the town I was practising in, got the idea that he was going to die at just 11 o'clock in the forenoon of a certain day. About 9 o'clock a messenger came for me, I hurried out. When I got there the crank had fifteen

minutes to live, according to his calculation. He did look like a man on the verge of eternity. His eyes were dim and sunken, his face had that peculiar pallor which heralds the near approach of death, and his breathing was very labored. The family were gathered around and weeping as they took a final leave. Something had to be done quick. There was a smart-looking woman there, and I called her aside. Pointing to the clock on the mantlepiece, which the patient was watching, I said: 'When I have his attention, turn that ahead.' Then I crowded into the family group, bustled them into the next room, sat down on the edge of the bed and began telling that fellow one of the most horrible murder stories you ever heard. I located it right in the town where he knew everybody, named the woman killed, went into blood-curdling details, and so completely interested the man that he forgot his eleven o'clock appointment. When I gave him a chance to look again it was twenty minutes to twelve, and he was actually mad for a time, claiming that he had been tricked. He finally got to laughing, and we all took dinner together. The next day he whipped two men at a barn-raising for twitting him about the programme of death that miscarried."

## THE LAW OF FINDING.

The law of finding, says a writer, is this: The finder has a clear title against the world, except the owner. The proprietor of a coach, or a railroad car, or a ship, has no right to demand the property on a promise. Such proprietors may make regulations in regard to lost property which will bind their employes, but they cannot the public. The law of finding was declared by the king's bench 100 years ago, in a case in which the facts were these: A person found a wallet containing a sum of money on a shop floor. He handed the wallet and contents to the shopkeeper. The latter refused to deliver them upon the ground that they were found upon his premises. The former sued the shopkeeper, and it was held as above set forth, that against all the world but the owner, the title of the finder has been held to stand in the place of the owner, so that he was permitted to prevail in an action against a person who found an article which the plaintiff had originally found, but subsequently lost. The police have no special rights in regard to articles lost, unless those right are conferred by statute. Receivers of articles stolen are trustees for the owner or finder. They have no power in the absence of special statute to keep an article against the finder, any more than a finder has to retain an article against the owner.

## COMMERCIAL RELICS OF ANCIENT ROME.

An interesting discovery illustrating the commerce and the luxury of ancient Rome has been made close to Monte Testaccio and the English cemetery. The whole of that district to the west of the Aventine outside of the Porta Tregemina was occupied by granaries and warehouses for the storage of imports of all kinds. Between the northern side of Monte Testaccio and the Tiber there still exist colossal remains of the great emporium built by Marcus Emilius Lepidus and Emilius Paulus nearly 200 years before the Christian Era. In the year 1868 a considerable portion of the quays was discovered, together with some 600 blocks, many of them of large size, of rare, variegated marbles of all kinds, lying just where they were landed from the galleys which had brought them from Numidia, the Grecian Islands, and Asia Minor, fifteen centuries ago.

Now, in the course of the building operations in this locality, two warehouses have been discovered, one filled with elephants' tusks and the other with lentils. It is curious to find such product stored side by side; but as bags of lentils were sometimes shipped as ballast, they may have served that purpose. The discovery would have been a very valuable one if, unfortunately, the ivory had not been much decayed.

## REMARKABLE DREAMS.

Among the most remarkable dreams on record the following will always have their place:

Breakfasting with some ladies on Wednesday, November 25, 1779, at his house on Hill street, London, Thomas, Lord Littleton, spoke of a very curious dream he had dreamed in the night. In this dream a bird flew into the room where he was and while he looked at it, it changed into a woman, who told him to prepare for another world, as in three days he would die. He was then well, and, as he laughingly said, he did not look like a man so near death. On the Saturday also, he felt perfectly well, and believed he should "bilk the ghost."

Some hours afterward he went with Mr. Fortesque and Captain Wolsely to Pitt Place, Epsom, ate for supper an egg, went cheerfully and talkatively to bed, hoped he should have good rolls for breakfast and suddenly expired, while Stucky, his servant, was assisting him to remove his under waistcoat. This story has been told in various ways. The above account is that given by Lord Westcote, Lord Lyttleton's uncle.

John Aubrey tells that a poor cloth-worker's wife, living in Gilford, named Abbott, dreamed that if she would eat a jack, her son, who was about to be born, would grow up and become a great man. Early the next morning she went to the river for water and caught in her pail a fine jack, which she cooked and ate—all or nearly all. The child was born, grew up, became a scholar in the town, and finally became Archbishop of Canterbury—of course through his mother eating the fish, or so thought John Aubrey, F. R. S.

Vouched for by tradition and history the strange dream of the Swaffham tinker has a fair claim to rank with the wonderful dreams to which this article is devoted. The story of it runs as follows:

About three hundred or more years ago, the above named ancient town in Norfolk, remarkable of old for its healthiness and beauty, had among its inhabitants an industrious, hard-working tinker named John Chapman, traditionally said to have been the beneficent builder of the north aisle of Swaffham Church. Certain it is that in the north aisle there are various devices of a peddler and his dog, and of a shop-keeper or Chapman, which seems like a rebus upon the traditional name, a species of conceit prevalent in ancient times. Certain also, it is, that in 1462 the name of one of the church wardens was Chapman, and that in each of the original windows of this aisle was a painting of the tinker, his wife and three children.

One night the tinker dreamed that if he went to London and stood on London bridge he would there meet some one who would make his fortune and put and end to all the weary wanderings over hill and dale in search of work. Deeply impressed by this dream he spoke of it in the morning to his wife, so seriously and with such an evident belief in it, that she both scolded and laughed at what she called his folly. Strangely enough, as the tinker thought, the dream which had haunted his mind all day was repeated on the next night; and the impression, thus deepened and strengthened, not unnaturally brought a third repetition of it on the night following, after which John was no longer withheld from going to London.

Despite the remonstrance of his friends, the entreaties of his wife, and the ridicule of his neighbors, the tinker set out to travel all the way afoot, a distance of not less than ninety miles. At the close of the third day he reached the end of his journey, slept at an inn, and early in the morning stationed himself on London Bridge, at a spot which he remembered was that pointed out to him in a dream. And there he remained all day, eyed curiously by the passers-by and suspiciously by the shopkeepers who lived on the bridge and by the keepers of its gates, which closed at a certain regular hour to guard the city fron evil characters, on which the Bankside and other parts of Southwork had a larger share than was good for its reputation. Nothing was, however, said to him that appeared to be in

any way connected with his dream.

The experiment was repeated on the second day with no other result than that of intensifying the curiosity and suspicion which he had provoked on the first day. But after he had passed the third day on the bridge, and the evening gloom, which warned him of the closing gates, was again upon him, one of the shopkeepers, who had eyed him wonderingly on each previous occasion, ventured to ask him what possible reason he could have for standing there every day and all day long. The tinker confessed that he had been induced to make a fool of himself by a very singular dream. The stranger laughed at him heartily. "If I had been as credulous as you are," said he, "I should be on just such another fool's errand; for three nights this week I dreamed the same dream, and in it I was told to go to a place called Swaffham, which I find is ninety odd miles away. I thought in my dream that under an apple tree in an orchard on the north side of the town I was told to dig, and that there I should discover a box full of money."

After some further questions and answers on either side they parted; and the tinker, saying nothing of the place he had come from, went away again hopeful and with restored cheerfulness and faith in his dream, set out early the next morning for home. One of the first things he did on reaching it was to visit the orchard indicated by the stranger's dream. He recognized it at once by certain peculiarities of the tree he had asked the London dreamer to describe, and digging under it, soon laid bare the top of an iron box. To unearth this and convey it to his house unobserved was his next task, and this accomplished, it was opened and found to be full of money. Imagine his triumph and delight! On the outside of the box were some words, which, being unable to read, he did not know the meaning of. Afraid to make his secret known or arouse the suspicion, which might lead to unpleasant circumstances, he hit upon a plan for finding out what the words said. This was to place the box at the door of the grammar school, so that its inscription might be read by the boys as they came out and while he stood by, as if by accident. The boys soon gathered round the box, and one scraping the dirt and rust from the inscription, read, doubtless amongst much laughter, the apparent meaningless lines:

Where this casket stood
Is another twice as good.

Hearing these significant words, John Chapman went away, hardly able to restrain his exultation and pleasure, and early next morning he was again digging in the deserted orchard, where his efforts were rewarded by the discovery of a second casket, twice as large as the first and equally well filled.

## LINCOLNSHIRE DIALECT.

Our American customs of calling the prong of a fork a tyne is a Lincolnshire peculiarity, and came over with our forefathers. The more general word prong is indeed driving it out, but a tyne is understood in Lincolnshire alone. The older men here distinctly remember the pronunciation of nature and creature, natur and critter, just as they were pronounced in New England fifty years ago. Perhaps the most amusing of these local peculiarties is the old-fashioned Lincolnshire way of calling a cucumber a cowcumber, which the older readers of The Courant will promptly recall as common in their childhood. So, too, the quaint archaism which many of us so well remember of calling a cow a caow, and a pound a paound, remains in full force not only in Lincolnshire, but has extended throughout England, and may be called the accepted pronunciation of the diphthong ou. I hear it not only in the cathedral pulpits, but on the lips of the shop boys. It has survived in Philadelphia and perhaps elsewhere with us, but it has mainly been laughed out of New England.

But to me the most interesting connection between Lincolnshire and New England pronunciation is the little word "been." It has long been a wonder to me how and why that word should be pronounced not only in New England, but throughout the

United States, so differently from what it is in England, Scotland, Ireland, Canada, Australia, Nova Scotia, South Africa; it is made to rhyme with seen and between, whereas in our country it is made to rhyme with sin and din. It was all explained when I came to Lincolnshire and found that the old local usage there was to call it bin, and that it is not entirely driven out to this day. I have not been able to trace that other old-fashioned pronunciation of the same word, "ben;" I could not find it in Lincolnshire. But many words which the older people will remember as now mostly gone by, such as put with a short u, pretty pronounced puhty, and purty, heard pronounced heerd, I find well remembered in Lincoln and Boston.—Hartford Courant.

## TURQUOISE.

The first historic record of turquoise mining in Persia, occurs about the tenth century, A. D., and for ages has been one of the most important sources of wealth in this country. The Persian name for the stone is Firvoz, and the mines now worked are the same as those worked 800 years ago. They are found in Kerman and Khorassan, though the former are now almost abandoned, the light green color and early fading making them of small value. These mines are of great depth, and access to them is hazardous. The Persians and the people of the United States prize the darkest stones, while in Europe those of a fine light blue, of medium intensity are preferred. The former are more rare, and retain their color longer. Although in general, size has much to do with the value of a turquoise, color is the final test that fixes the price. There is a turquoise now in the bazaars, no larger than a pea valued at $800. All the mines of Persia are farmed by officers connected with the Persian government. They pay a yearly rental to the shah of 18,000 tomans, or $30,000. There are no other mines known in modern times that have produced stones of noted value, or in any quantity, except the mines of New Mexico.

The New Mexico mines are two in number, and are located about eighteen miles southwest of Santa Fe, in the Cerrillos mining district, being known as the Chalchuitl and Castillian. The history of the former mine is very interesting, associated as it is with the earliest Spanish conquests, where avarice and cruelty resulted in bringing about great loss of life and many reverses to the Spaniards.

This mine was probably largely worked by the Aztecs more than 300 years ago, so that in 1540, when Coronado and his followers penetrated into this country and captured (after a severe siege) the present city of Santa Fe, then a populous Indian village, their cupidity was aroused and enslaving their poor captives for more than 100 years the gloomy recesses of the mine were thickly populated by the hapless race, lashed by the most cruel of taskmasters.

The veins of turquoise in this mine run horizontally instead of vertically, as in the Castillian, and it was so extensively undermined in getting out the precious material that on one inauspicious day in 1680 the whole top of the mountain settled down, crushing and burying about eighty Indian miners. This terrible calamity, coupled with the fact that an effort was soon made by the Spaniards to re-open the mine, thus violating one of the fundamental principles of the Aztec faith, never to molest graves of kindred, so incensed the Indians that they rose in rebellion and successfully expelled their former conquerors from the country. Santa Fe was captured, many of the Spaniards were massacred, and the balance compelled to flee for their lives, the Indians being complete masters of the situation for a period of sixteen years. So intense was their hatred of the Spaniards that San Miguel church was leveled to the ground and everything portable taken to the plaza and burned near where the soldiers' monument now stands. It is believed that many historical and official documents that were in the governor's palace at the time were thus lost, and that valuable mines and springs were filled up and destroyed out of revenge.

1886.

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HERBERT SPENCER'S ESSAY ON RELIGION—A CRITICISM. Nathan C. Kouns, author of *Arius the Libyan, Dorcas, Faustina, etc.*

THE CRADLE OF THE HUMAN RACE. Edwin Coombs (a review of Dr. Warren's book, "Paradise Found").

SOME NOTES OF THE PERIODICAL CICADA. Prof. C. V. Riley (Read before the A. A. A. S. at Ann Arbor).

LIFE IN UNCONSCIOUSNESS. Frederick Hartman.

A CHINESE COLUMBUS (*concluded*) etc., etc.

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A considerable degree of pleasure was experienced a week or so ago when the REVIEW made its appearance in my mail. I had frequently expressed regret that its publication had been suspended—I feared it was a thing of the past. I enclose you a dollar to pay till New Year and hope it may *never die again*.

Yours etc., T. BERRY SMITH,
*Professor of Chemistry, Pritchett Institute, Glasgow, Mo.*

The KANSAS CITY REVIEW OF SCIENCE AND INDUSTRY has been changed to the more simple and appropriate KANSAS CITY REVIEW, T. S. Case, M. D., and Warren Watson, editors. It is a live exponent of the scientific and industrial interests of the West.—*Iron Trade Review.*

The publication of the KANSAS CITY REVIEW OF SCIENCE AND INDUSTRY has been resumed. The name has been abbreviated to the KANSAS CITY REVIEW, which is an improvement, as the former name was rather cumbersome. The first number of the new series, which is at hand, offers a very interesting, instructive and entertaining table of contents. The student, the scientist and the general reader will find much that is valuable in the contributions which make up the offerings of this number, which, we are informed, is but the forerunner of even better ones to follow. The names of Dr. Theo. S. Case and of Mr. Warren Watson as editors are a sufficient guarantee that the high standard of this magazine will be maintained. We commend it to all lovers of good literature and wish it unbounded success.—*Jefferson City Tribune.*

The September number of the KANSAS CITY REVIEW will be out this week. A glance at the well-filled pages of this off-spring of Western thought and enterprise must convince the most casual observer that it is decidedly the most entertaining number yet put to press. "The Beginnings of Language," "Early Stages of the Earth's Growth," "Death in Life," "A Chinese Columbus," "Wonderful Productions of the Ocean," "The French Academy," "A Fish Eating Plant," and "Our Consular Service," are among the most interesting of the articles. A meteorological report for August is given. The editorial department, unlike that in most magazines, is lively and spirited, each subject being handled in a fresh and attractive manner. Under head of "Scientific and Industrial notes," a whole volume of important and useful information is given. Those of the Sentinel readers who are not subscribers to this valuable periodical should become so, and while securing for themselves a valuable Western magazine, aid an enterprise that deserves their support.—*Independence Sentinel.*

We commend Col. Case for his determination to shorten the name of his instructive magazine to the KANSAS CITY REVIEW.—*Kansas City Times.*

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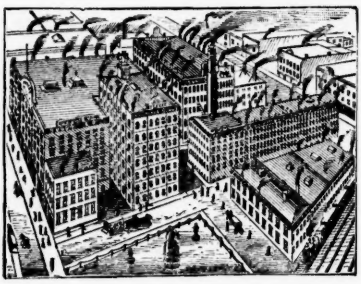

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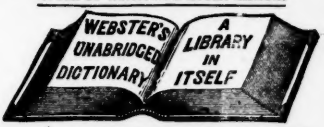


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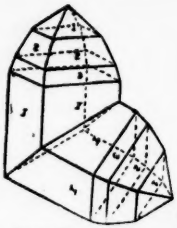

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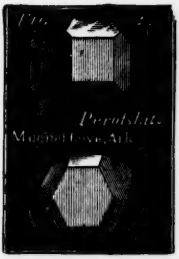


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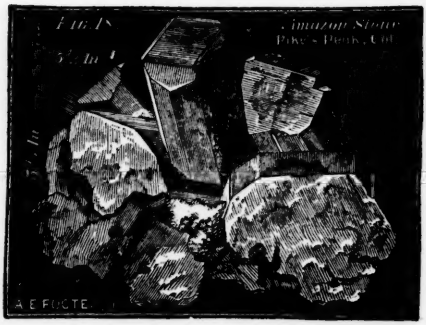


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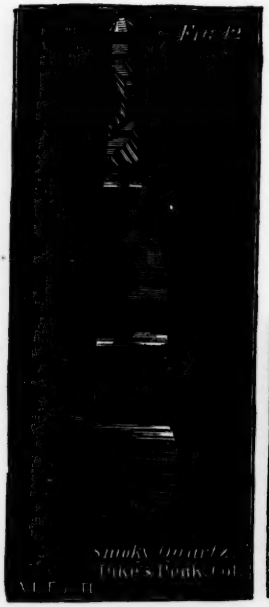


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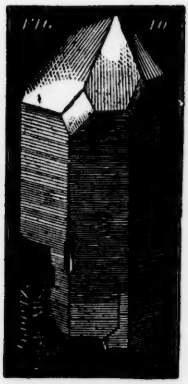

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I am much pleased to see the REVIEW again on its way, and I trust it will flourish. ROMYN HITCHCOCK, *Editor Microscopical Journal*

The KANSAS CITY REVIEW's modest cover does not in any way detain the gazer, but a glance beyond lures one to read on, and, reading, he becomes convinced that Kansas City literature, though it is from the West, has made a career for itself. We learn through the Periodical of a paper on "Photography and Medical Jurisprudence," by W. Matthews.—*Photographic Times and American Photographer.*

I herewith enclose $1.00, which I believe pays for the REVIEW up to January, 1886, as per your advertisement. Congratulating you upon the auspicious commencement you have made in your new enterprise, I remain,

Yours Truly, CHAS. E. PUTNAM,
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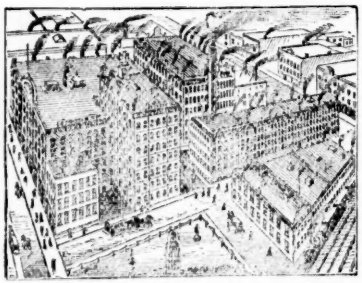

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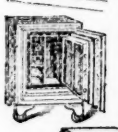

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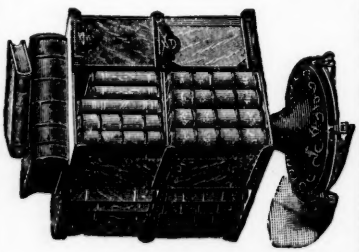

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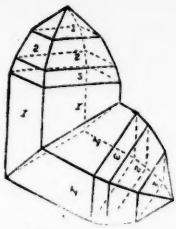

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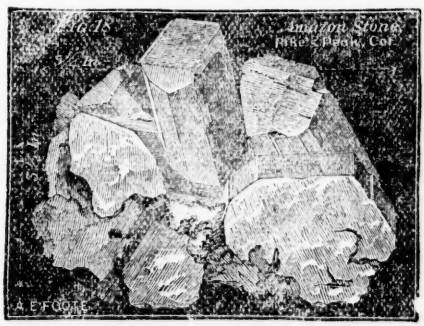


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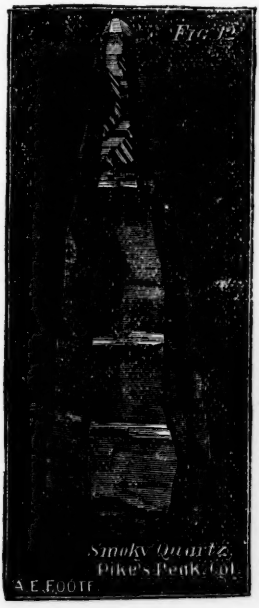


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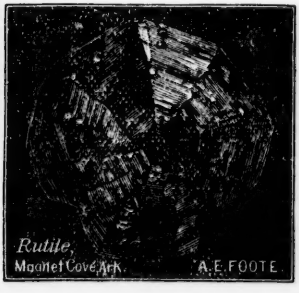


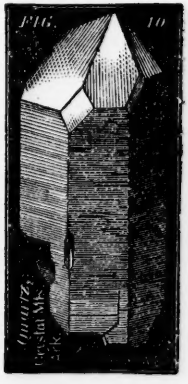

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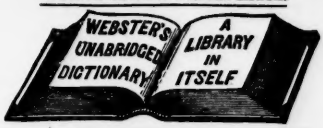


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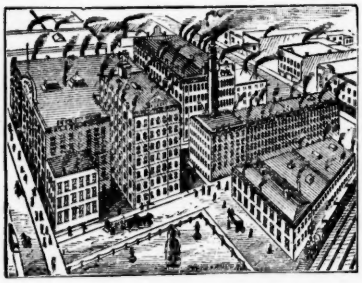

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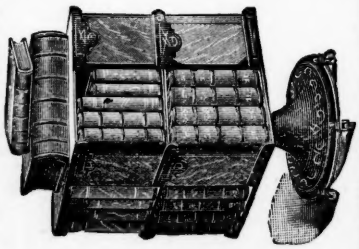

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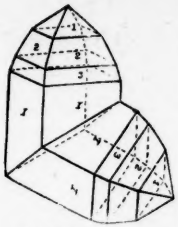

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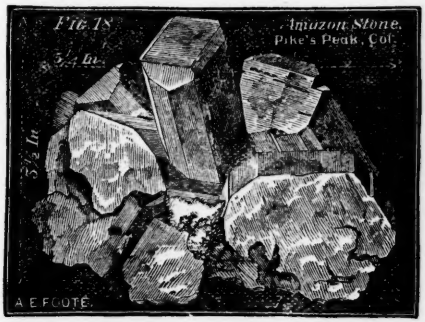


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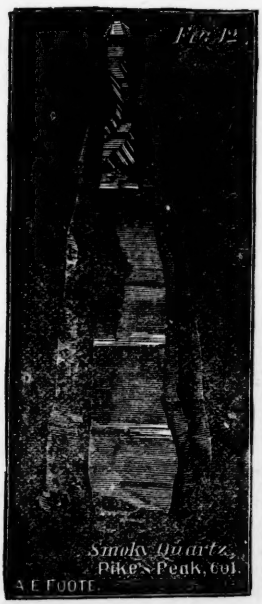


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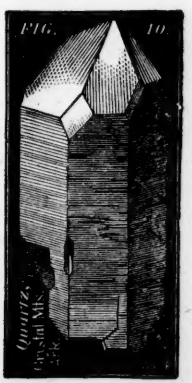

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**The Largest Wholesale and Retail Dry Goods House under one roof in the West.**

We have four Dress-Making Departments, each under a thorough and distinct organization. One of our "Modistes" is sent to Europe every year, while others are sent "East" every season.

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## LADIES' DRESSES,

COSTUMES, Etc.

We also have a Department for Producing

## LADIES' TAILOR-MADE SUITS

—AND—

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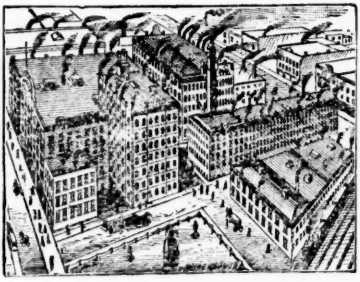

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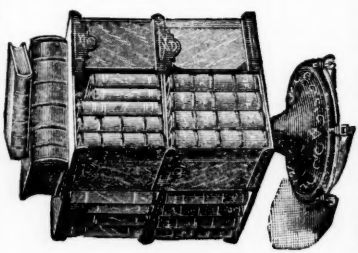

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